the OIL AND GAS JOURNAL

JUNE 24, 1957

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Down to the sea for oil

HALLIBURTON
OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

In the perpetual search for new fields to replenish America's sources of fuels and lubricants... more and more oilmen are seeking and developing offshore oil. Halliburton, too, guided by the policy of providing oil well services wherever they are needed, goes "down to the sea"... provides marine equipment, cements and methods to help Halliburton customers surmount the obstacles raised by sea, swamp and lake... and safeguard production economically and efficiently offshore as well as on.

SEAGOING WELL SERVICES... A SHORT RUN FROM YOUR OFFSHORE RIG

JOURNAL News Letter

June 24, 1957
Tulsa, Okla.

1957 may be the poorest year in recent history for finding new oil:

Here's the picture as the industry nears the mid-year mark: Crude-oil production for the first 5 months totaled 1,130,000,000 bbl. But new crude reserves, based on discovery of 12 bbl. per foot drilled, amounted to only 1,098,000,000. If this continues through the year, it will mean a 12-1/2 per cent drop in new discoveries, putting them below production for the first time except for the abnormal war year of 1943.

Why the sudden reversal?

Drilling has slumped. Take a look: Completions are off 9 per cent--22,041 wells compared with 24,222 at this time last year... Footage is down 7.4 per cent.

What's the explanation for the drilling story? Every operator has his own answer. Just a few are: Wells are deeper and costlier... Less oil is being found per well... Crude-oil market and uncertain prices make drilling ventures more risky... Money is tight... Drilling funds are being diverted abroad and offshore ... The weather has been bad this spring.

The fact remains: Unless drilling picks up strongly and soon, the situation won't change. This doesn't mean the U. S. is running out of oil. It means simply that so far this year the industry just hasn't put enough money into domestic drilling to find the oil it can and must find (P. 97).

CAPITOL STORM: Nomination of Jerome K. Kuykendall for another term on the FPC ran into rough weather at the capitol last week. Two senators and a handful of congressmen are opposing reappointment. Issues involve around the gas bill and Hells Canyon dam. Kuykendall is being accused of not calling in consumers last winter when he reportedly was asked by the President to draft a bill along lines of vetoed Harris-Fulbright measure.

Indications are that Kuykendall will be confirmed despite the opposition.

EXPLORATION: One of the year's best pieces of geological information is coming from a deep wildcat in Webb County, Southwest Texas. The Ginther, Warren & Ginther 1 O. W. Killam has confirmed that the famed Pescadito structure is a huge salt dome. This gives a far west extension to the Southwest Texas Salt basin. Also important: It raises the great possibility of a really large oil pool somewhere in the area.

Long-awaited decision on Louisiana's seaward boundary may be handed down by U.S. Supreme Court this week. Court is trying to clean up its docket prior to recessing for the summer. It will wind up its term this week. If decision doesn't come now, it will be delayed until fall. At stake is extent of rights of Gulf Coast states to submerged resources of their offshore waters.

Geologists now think the 2 Broor Haiel wildcat in Israel apparently has found a new field on the Heletz trend. The new well is 5 miles southeast of the original Heletz discovery and 2 miles southeast of the field's most southeasterly well. But the wildcat is separated from Heletz field by a dry hole.

Oil hunters had a pretty good month in May. Top geological news for the month was first oil discovery around a salt dome in North Louisiana. But best production news continued to come from Paradox basin where five new discoveries were recorded. Other wildcats hit in Oklahoma, California, Galveston Bay, Williston basin, Powder River basin, and Permian basin (P. 238).

Two big parcels in Western Canada's hottest exploration grounds this year will be put on the block next month at Alberta's third crown reserve sale for the year. The blocks include 184,320 acres in the Virginia Hills area and are flanked by spectacular discoveries in Virginia Hills and Swan Hills areas.

Geophysical Service, Inc., has come up with an interesting approach to a double problem: How to interest the best young minds in a career in oil exploration and how to keep them interested and growing in technical ability once they're hired. The G.S.I. answer is a summar tour of work in the field for a select group of collegians and a novel on-the-job training course in geophysics by correspondence for employes.

DRILLING: It looks like plenty of drilling business ahead in New Mexico's northern Lea County. A yet unnamed basin there is proving a successful oil-hunting ground. Three wildcats last week were showing for discovery wells.

The first wildcat in Alaska for Colorado Oil & Gas has been abandoned in the Yakutat area because of mechanical difficulties. Operations were suspended at 9,314 ft. after driller was unable to recover 9 drill collars lost in the hole. Firm is planning another test 3 miles east this summer. It reported encouraging shows in the first well.

Drillers in the Aneth area of Paradox basin report only one king-size headache: Transportation. Other problems: Shallow gyp-water flow on almost all locations... Bad loss of circulation in the southwest edge of the basin at a depth of 3,500 ft... Troublesome anhydrite and deep salt-water flow in the Ismay area.

Royal Dutch-Shell has placed an order for a new drilling platform to replace the one wrecked last year in a Persian Gulf storm. Shell plans to resume its oil hunt offshore near Qatar after a 2-year setback. Another Shell subsidiary has just launched a shallow-water drilling platform that will be used to drill a dozen wells about a mile offshore from Seria field in British Borneo. Seria is the Far East's largest producer.

L. H. and S. A. Olson Drilling Co. of Midland, Tex., has gone out of the oil drilling business. The Olson brothers and W. R. Weaver of El Paso got $4,925,000 from El Paso Natural Gas Products for five rotary rigs, 86 oil wells and one gasser in South and West Texas. Wells currently are producing 1,700 bbl. daily. El Paso kept one of the smaller rigs and turned others over to

National Supply Co.

PRODUCTION: Imports are hitting record levels. Crude runs to refineries have taken a sharp drop. Domestic production is declining. That's the industry production picture painted in latest A.P.I. statistics. Crude imports reached 1,726,000 bbl. daily in mid-month, a new all-time high. In the same week refinery runs fell off 353,000 bbl. daily due to voluntary cutbacks and strikes. The daily average domestic production, meanwhile, was 7,294,050 bbl. daily, a drop of 43,900 bbl.

The production outlook is for further decreases next month. The Texas Railroad Commission has slashed that state's July allowable by 390,449 bbl. daily. The statewide pattern was set for 13 producing days or an allowable of 3,027,786 bbl. daily.

Gulf Oil has last another round in its fight against the Oklahoma Corporation Commission. The agency has ordered Gulf and other common purchasers to take all the oil offered them up to the allowable of each lease unless specifically exempt. The U. S. Supreme Court last week refused to take jurisdiction on Gulf's case, ruling Gulf had not exhausted its legal remedies in state courts.

Pan American Petroleum is proposing a water flood for Willimar field in extreme South Texas which may net an extra 25 million barrels of oil from the 7,000-acre field. Operators have been injecting gas in the field since 1951 but believe this program has just about served its purpose.

Some California oil economists are taking an optimistic view of the state's oil production for the next 10 years. They believe secondary-recovery projects plus new offshore oil reserves will more than offset declining production.

Egypt's Belayim field on Sinai Peninsula appears to be getting under way on its long-awaited development. Production hit a record 11,900 bbl. daily in April. This compared with 1,900 bbl. daily in March, first month of operation after Israeli troops withdrew after overrunning the field.

REFINING: A long-range synthetic-fuels program based on coal is being planned by Union Pacific Railroad. Plans hinge on changing U.S. Mineral Leasing Act to allow railroads to use coal they mine on leased public lands for other purposes than fueling locomotives. The company is studying plans for making synthetic fuels and chemicals from Rocky Mountain coal. Railroad would use the fuels in its locomotives and market the chemicals. Char left after extraction may be used in generating electric power for U.P.'s planned development of iron-ore deposits northwest of Cheyenne.

The Great Lakes Products Pipe Line may be moving 99-Octane premium gasoline soon. Refiners using the line have been quizzed on possibility of marketing the high-octane premium. Present specifications on line are 98 for premium and 89 for regular.

Unionized labor has put the final touches on 1957 wage negotiations. The closer was a 2-year contract with Sinclair calling for the familiar 6 per cent pay raise. The 2-year term provision is the first in the oil industry for O.C.A.W. Sinclair immediately made a sound move. It announced higher prices for its products. But in view of the market, it's still a question whether the higher prices will stick. Meanwhile union workers continued their strikes over retro-

active date of new contracts at eight plants of Ohio Standard, Socony Mobil, Crown Central, and Pure.

More refiners and chemical-plant operators are farming out their routine maintenance to contractors. They've found the arrangement actually increases efficiency and reduces costs (P. 123).

A Journal survey reveals contract maintenance is used more frequently by refiners for unit turnarounds than for routine maintenance during operation. Plant size is apparently no factor in determining whether to contract the maintenance or have company crews perform the task (P. 128).

Champlin will spend $1.9 million for a 1,430-bbl. hydrofluoric acid alkylation unit at its 31,000-bbl. Enid, Okla., refinery. Company will license the Phillips process and be on stream with the unit by March 1958.

A zoning controversy will be settled in Toronto this week deciding the fate of two proposed modern refineries for suburban Bronte area on Lake Ontario. Cities Service and Shell both propose 20,000-bbl. plants each costing $25 million.

British American Oil has broken ground for its 20,000-bbl. refinery at Port Moody near Vancouver. It'll be completed late in 1958.

PIPELINING: The city of Denver is pressing Colorado Interstate Gas to account for $53 million collected by the natural-gas firm under conditional rate increases and subject to refund. Denver has petitioned FPC to order the accounting. Company officials have said Colorado Interstate will be bankrupt if the FPC finally orders the full refunds.

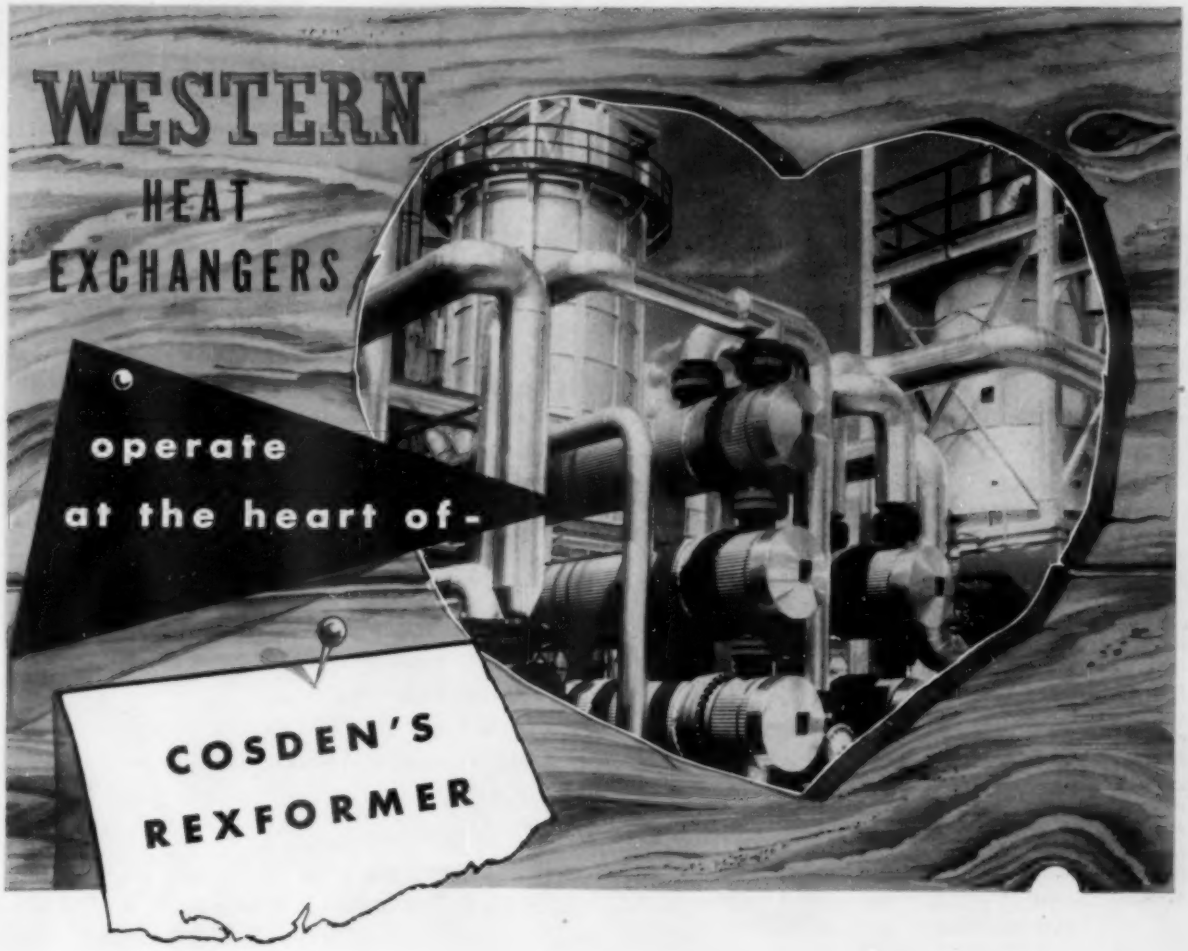
A show place electrically driven centrifugal compressor station has been unveiled by Texas Eastern Transmission. It has the lowest investment cost per horse-power in the industry and boasts unusually low operating costs. Big features: Station is powered by a single 15,000-hp. electric motor.

Need more compressor-station engine capacity? Two Magnolia engineers believe that supercharging existing two-cycle-engine installations should be seriously considered. They have proved the method successful during many thousands of operating hours (P. 160).

Work has started on the 1,500-mile gas pipeline from South Texas to Florida. Coastal Transmission says first job is on a 4-mile section of 8-in. line in Hidalgo County, Texas. Work started after arrangements were completed for placing first-mortgage pipeline bonds totaling $103-1/2 million, first step in financing the $150 million system.

Transcontinental Gas Pipe Line has begun a major expansion program to boost its peak-day deliveries to more than 1 billion cubic feet. Key job in project is 247 miles of laterals to tap large shut-in gas reserves in three southwest Texas counties.

The oil industry is shedding insulation from its growing fleet of L. P. G. railroad tank cars. The result will be millions of dollars in savings. Phillips Petroleum broke the ice by receiving authority to build new cars without insulation. This will save $600 per car. Since Phillips has 1,050 new cars on order, the savings will total $630,000. Phillips also lists these advantages of the uninsulated cars: Lower maintenance costs, lighter weight. Phillips' new cars also will be larger--they'll hold from 11,700 to 14,600 gal. instead of old 10,000-11,000 gal.



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The Oil and Gas Journal, Published Mondays, copyright 1957, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

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REFINING-MAINTENANCE REPORT . . . 123-138

Contract Vs. Do-It-Yourself . . . 123

By D. H. Stormont

More and more refiners are farming out plant maintenance to contractors. Those who follow this practice indicate that such contracting increases efficiency and reduces cost.

Chemically Cleaning Storage Tanks . . . 126

By W. R. Jameson and H. B. Green

Tank cleaning has traditionally been expensive, time-consuming, and dangerous. New cleaning methods based on the use of chemicals and special application devices have largely eliminated these difficulties.

Survey of Contract Maintenance . . . 128

By L. Turner

Results of this Journal study show that 45 per cent of surveyed refineries are now using some contract maintenance. It is used more frequently for unit turnaround than for routine maintenance.

Keeping Cooling Towers at Top Efficiency . . . 130

By L. M. Ferguson

This comprehensive report deals with problems of icing and fogging in cold weather; the need for frequent inspection of the entire tower, with prompt attention to maintenance and correction of any malfunctioning; and deterioration of cooling-tower wood and the various methods of control.

Circulation Cleaning with Detergents . . . 136

By A. T. Thibadeau

This type of cleaning has been used for 6 years on five towers in a large refinery's butane vapor-recovery unit. The job was done this spring in 2½ days, at a saving of nearly $2,400. Heat exchangers on the unit were also cleaned by this method.

TECHNOLOGY—OPERATION

Bottom-Hole Heating in California Fields . 142

By D. H. Stormont

Use of this technique in heavy-crude oil wells has increased oil production at an average of 10 bbl. per day per well. Pumps operate more efficiently and the cost of pumping is reduced.

Drilling Prospects for the Aneth Area . . . 152

By Ed McGhee

The Aneth area of the Paradox basin is one of the few bright spots in the drilling contractors' picture. All signs point to the need for more rigs and rapid development. Here is a discussion of the drilling problems and procedures in the area.

Supercharging for More Pipeline Compressor-Station Horsepower . . . 160

By R. G. Bolfing and H. B. Emery

Supercharging existing two-cycle-engine compressor installations is an economical and practical solution to the problem of obtaining increased horsepower. This method of increasing engine output has proved successful during many thousands of operating hours.

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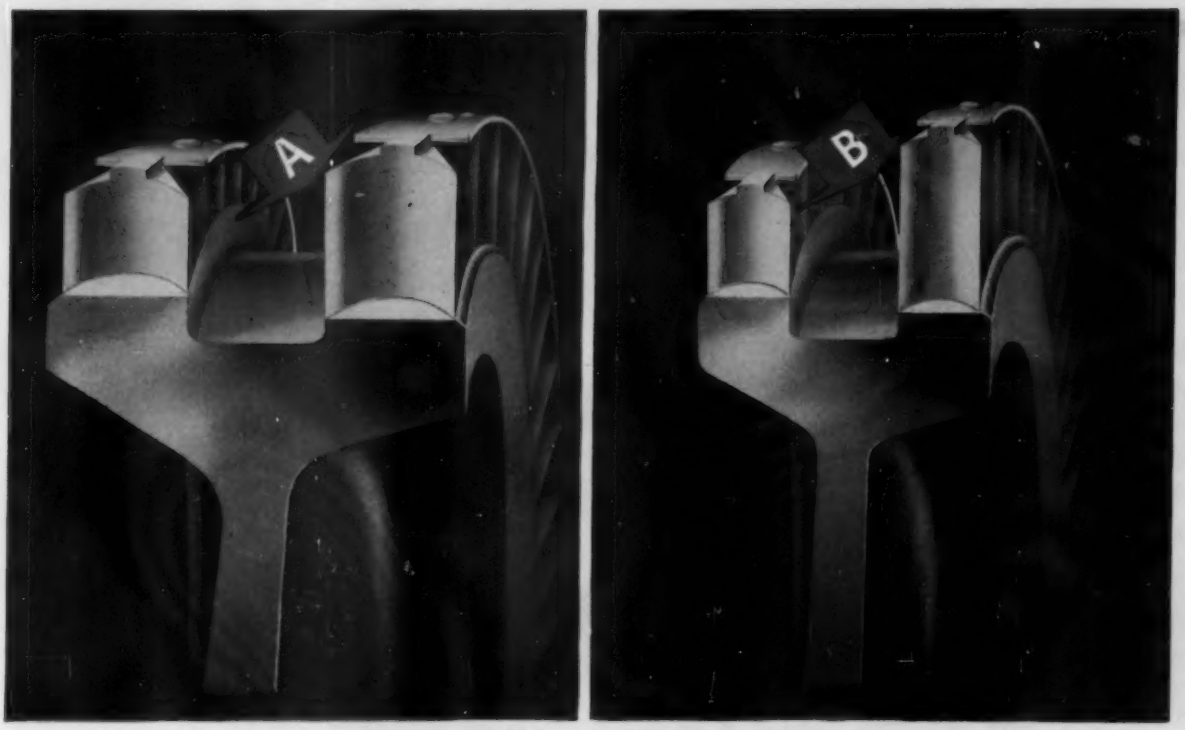

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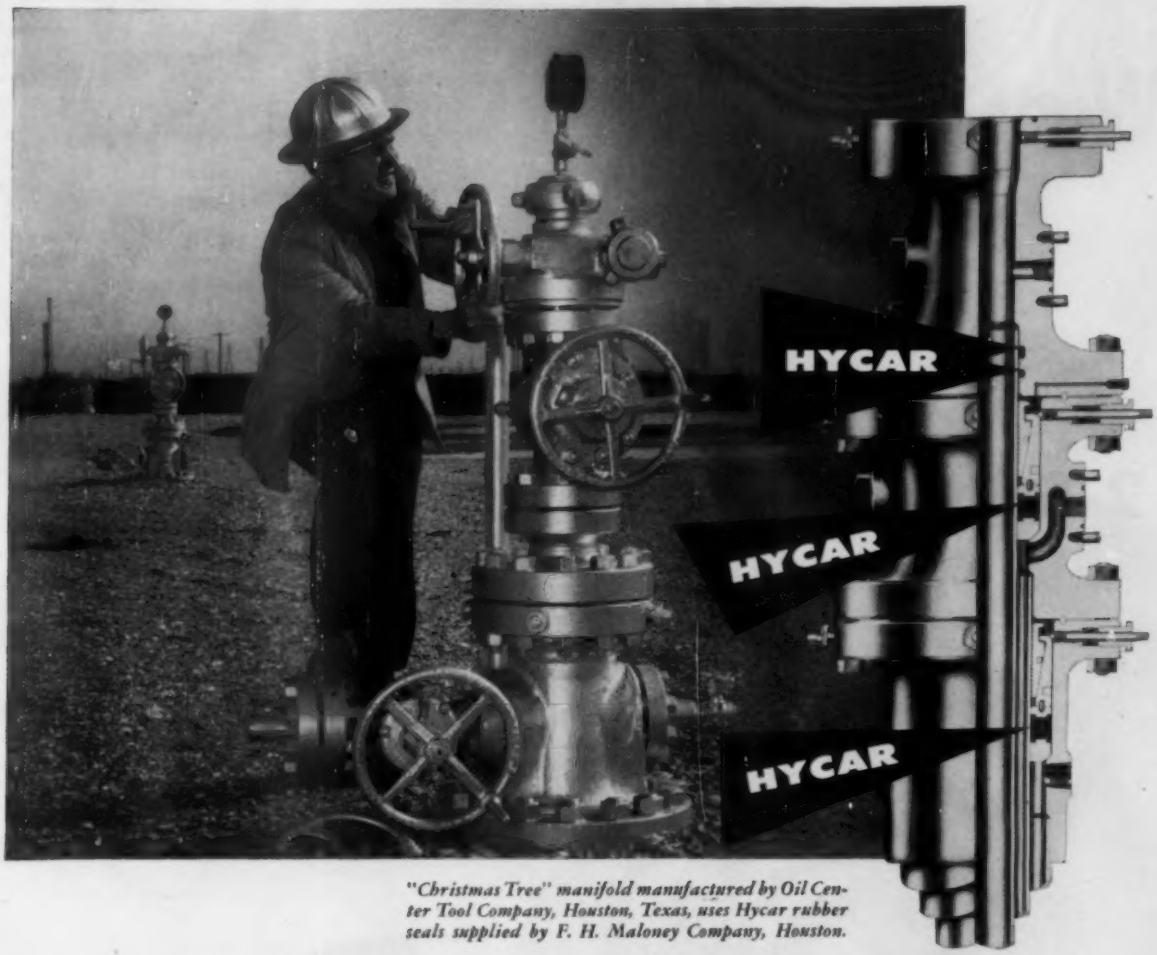

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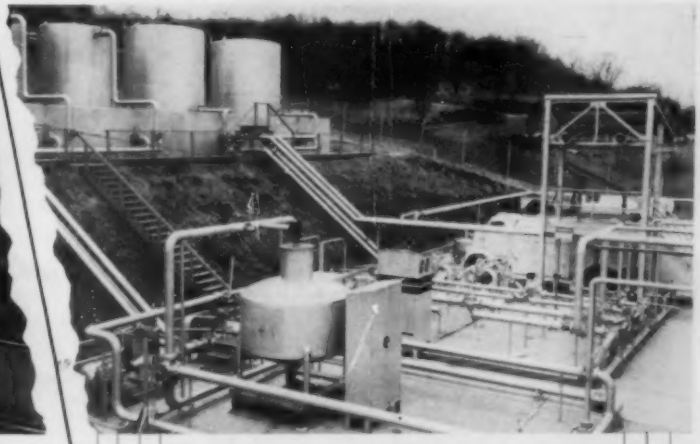

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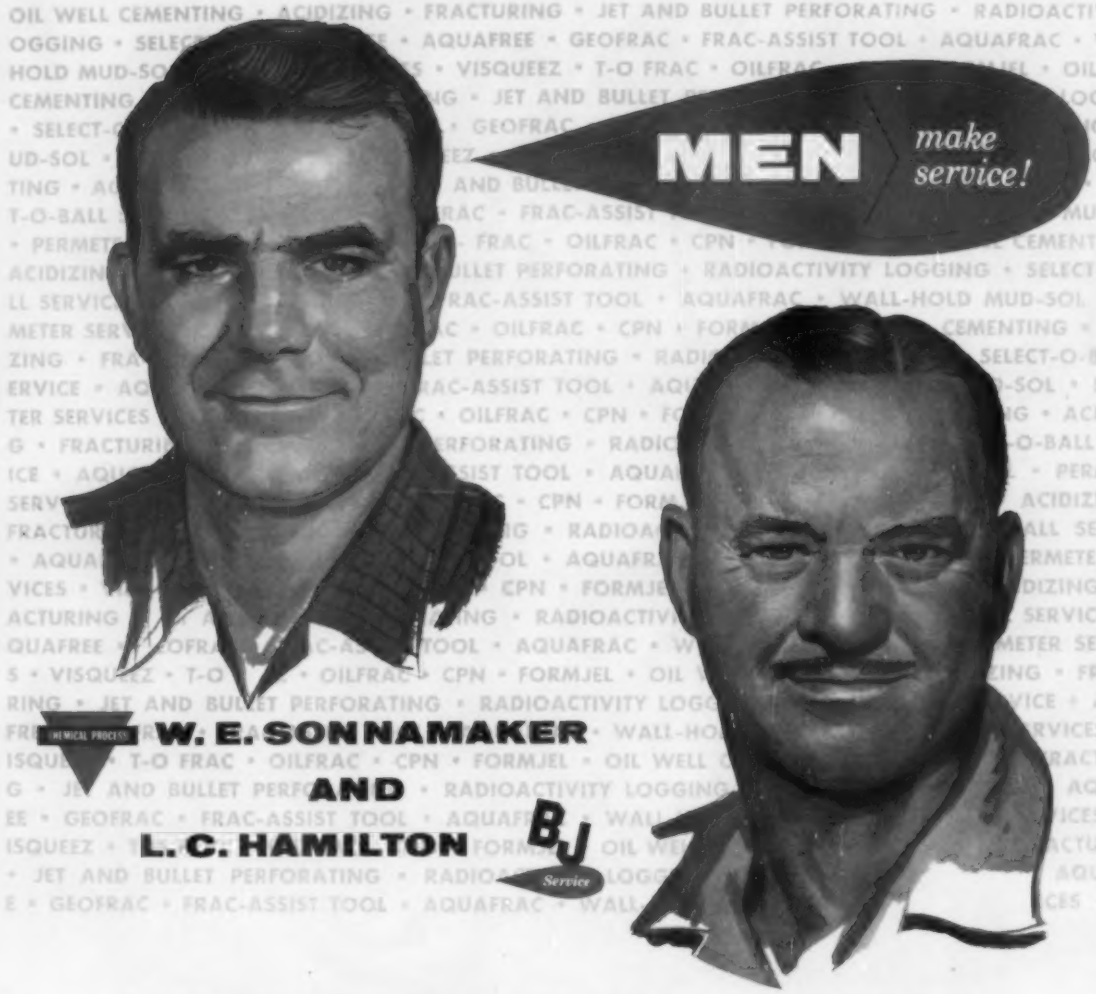
In world wide service this famous EXCEL-SO product has proven itself as a scientific measuring instrument—not just an ordinary welded tank. It is designed and fabricated to meet the most exacting requirements—meter testing under laboratory conditions. In stationary, portable and high pressure service it insures greatest metering accuracy for petroleum products. Write Warner Lewis Company for further information.

WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

DIVISION OF FRAM CORPORATION

Representatives in all major cities. In Canada: FRAM CANADA, LTD., Stratford, Ontario



MAKE SERVICE TWICE AS GOOD!

Service jobs that start out easy and then suddenly turn rugged make you appreciate men like W. E. "Sonny" Sonnamaker and L. C. "Ham" Hamilton.

Sonny, with Chemical Process, and Ham, with BJ Service, have this in common: a driving desire to give all-out service, on every job, to every customer. When the going gets tough and problem piles on problem, they know how to put together the answers, using guts, experience and the finest facilities in the oil patch.

These outstanding men are very typical of the outstanding companies they represent. Now that they have joined forces it is literally true that they make service *twice* as good—because this great new service combination brings together *twice* the manpower, experience and facilities, for the immediate and continuing benefit of our customers.

Next time you have an oil well service problem, call on the men who make service *twice* as good—the men of BJ Service-Chemical Process.

CHEMICAL PROCESS BJ Service

SUBSIDIARY OF BORG-WARNER CORP.

BJ SERVICE, INC.

General Offices and Laboratory—Long Beach, California

Stations Throughout California, Rocky Mountain and Permian Basin Areas

Chemical Process

General Offices and Laboratory—Breckenridge, Texas

Stations Throughout the Mid-Continent Area

Wherever You Go In The Oil Country . . .

100% BS&B EQUIPPED LEASE:
1—Type "S" Vertical Treater
2—125 lb. Vertical Separators
8—1000 bbl. Field Welded Steel Tanks
BS&B Automatic Controls
Safwalk Walkway and Stairway

100% BS&B EQUIPPED LEASE:
1—Series "70" Indirect Heater
2—Model "OGS" Spherical Separators
2—200 bbl. Welded Steel Tanks
BS&B Automatic Controls
Safwalk Walkway and Stairway

100% BS&B EQUIPPED LEASE:
1—Model WDH Dehydrator
1—Series "70" Indirect Heater
1—1000 lb. Vertical Separator
1—125 lb. Vertical Separator
100 bbl. Welded Steel Tanks
BS&B Automatic Controls
Safwalk Walkway and Stairway

You'll Find More And More Leases Equipped 100% BS&B!

"One good piece of BS&B oilfield lease production equipment deserves another"... that seems to be the trend of thought of an ever increasing number of lease operators these days!

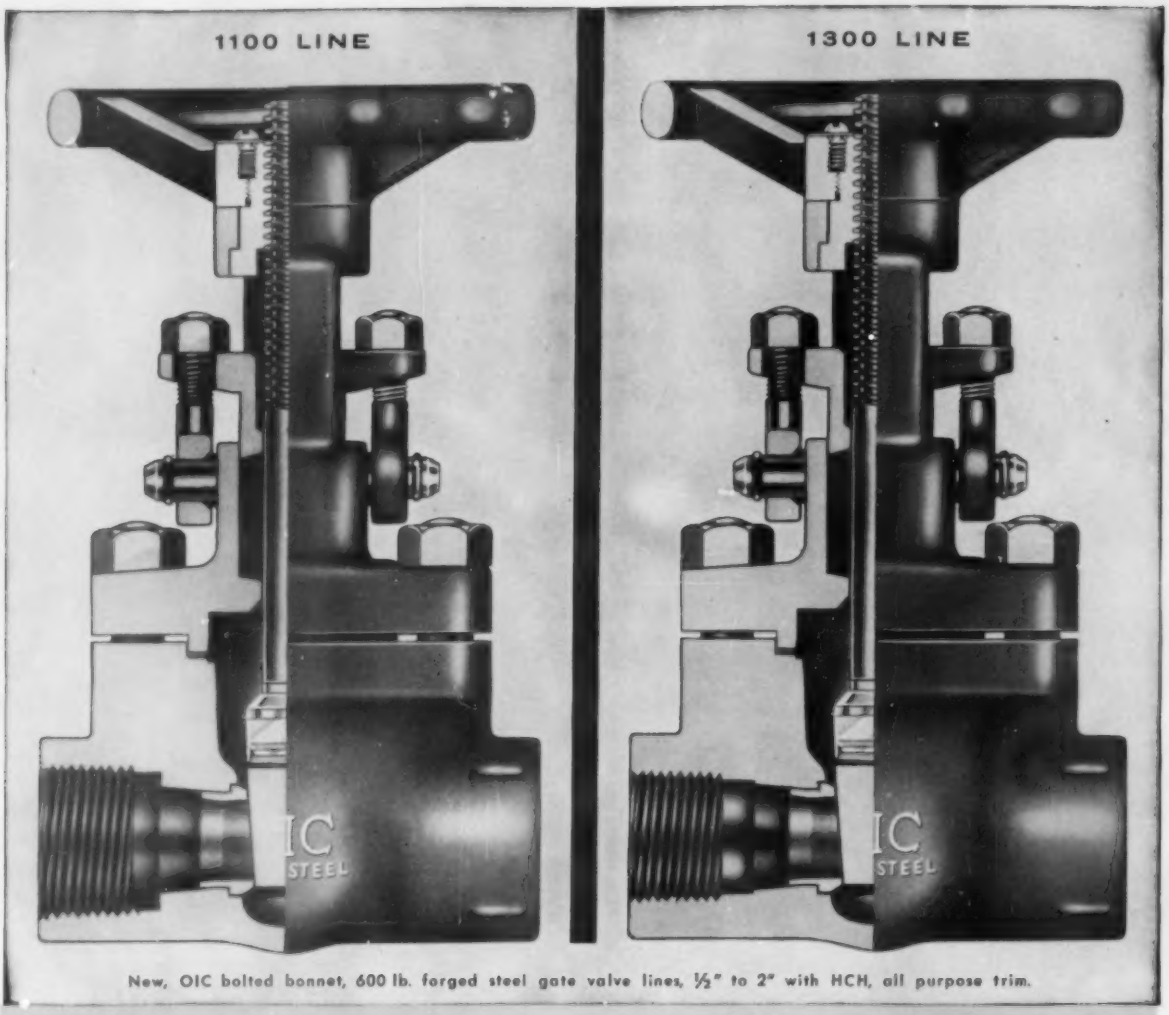
Many of them have tried first one, then another of BS&B's many equipment items... heaters, treaters, separators, low temperature separation systems, dehydrators, water knockouts, desulfurizers, tanks, automatic controls, safety heads, etc.

Their complete satisfaction with the equipment in terms of quality, initial cost, maintenance cost, performance and payout time has led them to convert to BS&B *exclusively* on new lease production equipment purchases.

If *you* are planning to put a new lease on production or replace equipment on an old one, take a tip from these profit-wise operators and go 100% BS&B! Better get in touch with your BS&B Man today!

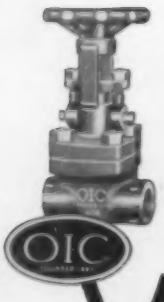
OVER 60 YEARS
BS&B
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Oilfield Equipment Division, Dept. 1-A6C
P.O. Box 1714 Oklahoma City, Oklahoma



New, OIC bolted bonnet, 600 lb. forged steel gate valve lines, ½" to 2" with HCH, all purpose trim.

2 new rugged OIC forged steel lines



Both feature the modern and rugged bolted bonnet joint, which simplifies and lowers the cost of maintenance.

Both feature a soft iron gasket securely retained in the bolted male and female body-bonnet connection to assure enduring tightness.

Both feature 13% chrome stainless steel trim with 1000 Brinell, duracased wedges.

Both feature plenty of gripping area for pipe wrenches on pipe ends; there's no interference with body-bonnet flanges. Simplifies joint make-up!

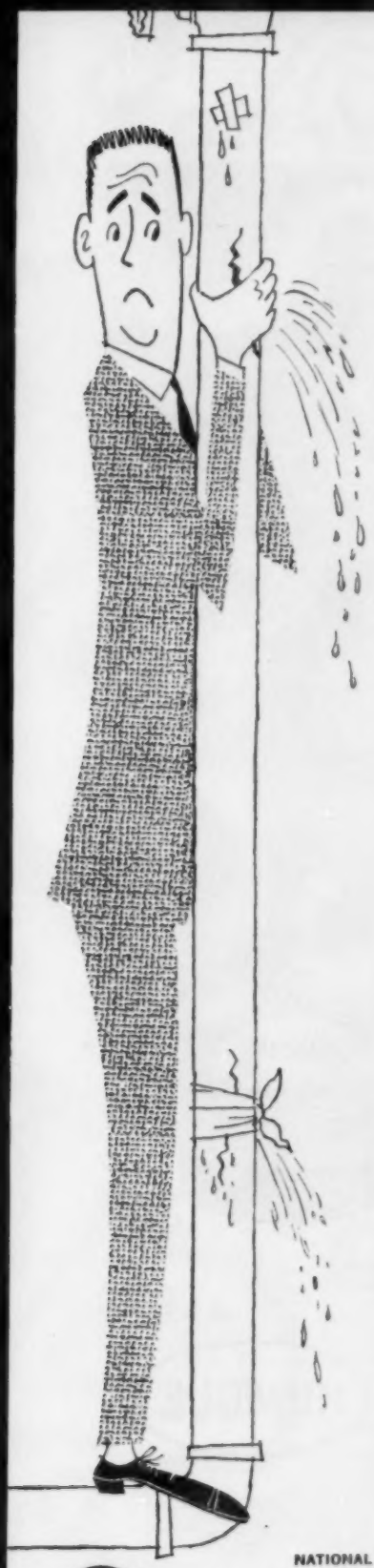
The 1300 line includes a *high flow* port area, offering full-flow characteristics.

The 1100 line, with standard flow ports, is compact, economical, and includes the same high quality, rugged features and trim as the 1300 line.

Most valve users have applications suited to both of these new OIC valve lines. Write for Bulletin *#195-R* illustrating features and specifications that fit these newest forged steel valves to your services.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES**



You say you have a pressure problem?

Nothing serious, we hope. But if you'd like some assistance with it just call on "National Tube." Pressure problems are our specialty. So are temperature problems, acids, oxidation, corrosion—in fact, all types of refinery tubing problems. We like to solve them.

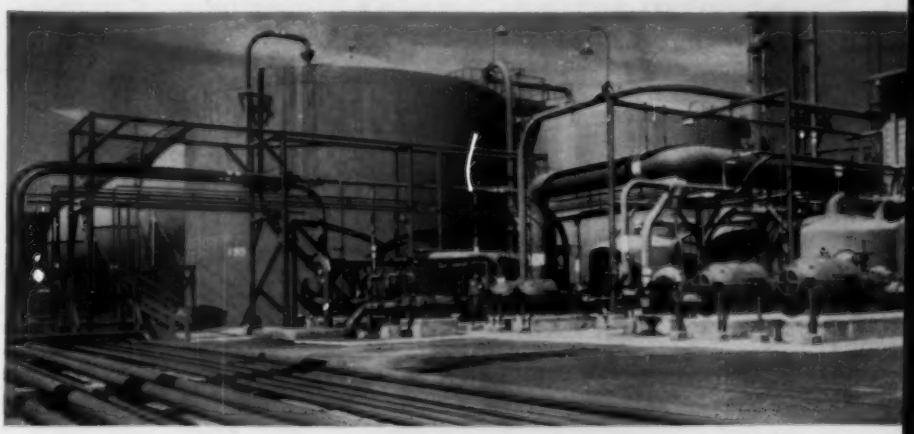
You see, we have a system. Here, at National Tube, we've kept case histories for many years—data on thousands of tough refinery tubing problems, each one solved by a specially prepared steel alloy. The result of this accumulation of knowledge is concentrated in 24 different steel tube analyses, each designed to combat a specific set of refinery conditions. Long, rigorous testing in actual refinery service has proved the capabilities of every one of these analyses.

In addition to these two dozen analyses, other chemical compositions are available in tubular products, and a wide variety of temperature problems is presently under study.

So, get in touch with us. Our Mill Service Force, available for field consultation, will help you find just the alloy you need, at the right price, to meet your refinery conditions. Write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

HERE ARE NATIONAL TUBE'S TWO DOZEN DIFFERENT TUBE ANALYSES:

Carbon	5 Cr, ½ Mo	17 Cr
Carbon, ½ Mo	5 Cr, ½ Mo, 1½ Si	18-8
1 Cr, ½ Mo	7 Cr, ½ Mo	18-8 Ti
1¼ Cr, ½ Mo	8 Cr, ½ Mo	18-8 Cb
2 Cr, ½ Mo	8 Cr, 1 Mo	18-8 Mo
2¼ Cr, 1 Mo	9 Cr, 1 Mo	25-20
2½ Cr, ½ Mo, ¾ Si	12 Cr	3½ Ni
3 Cr, 1 Mo	12 Cr, Al	5 Ni



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

WALLS WITHOUT WELDS

NATIONAL SEAMLESS PIPE AND TUBES

UNITED STATES STEEL

Paint protection against rapid corrosion **inside your pipelines!**

In-place coating with Humble's epoxy internal pipe coatings gives you proven protection against rapid corrosion in sour crude oil, salt water and natural gas lines. These durable coatings can be applied in a single application to pipelines in the ground. In addition to giving lasting resistance to sour crudes and brine, Humble epoxy internal pipe coatings give a smooth, glossy finish that cuts down paraffin deposition.

Humble internal pipe coatings are also available in vinyl and phenolic formulations.

For more information on Humble's complete line of protective coatings, see your nearest Humble wholesale plant in Texas and New Mexico, or write or phone:

HUMBLE OIL & REFINING COMPANY

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Technical Service
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P. O. Box 2180
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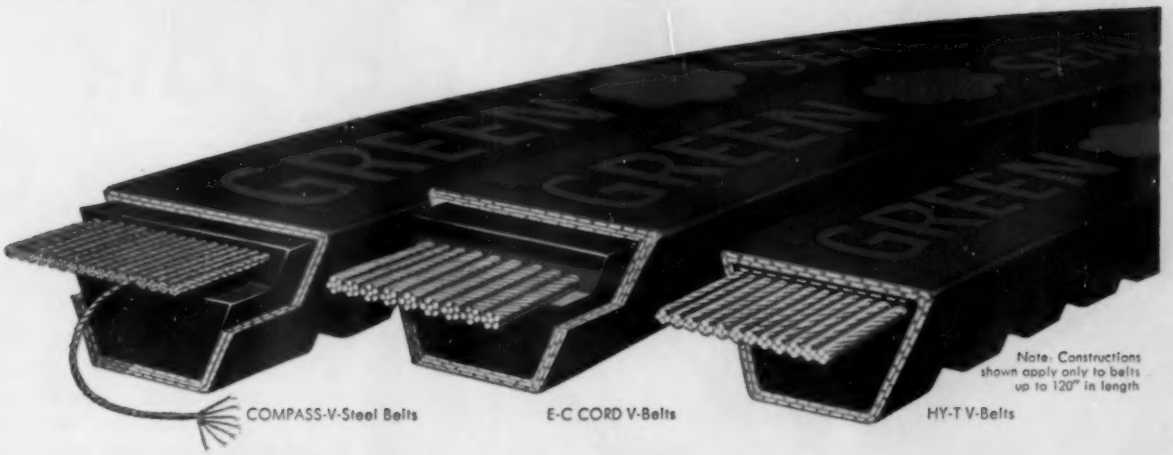
Now—V-Belts with the Green Seal solve the major multiple drive problem



The Green Seal stands for true dimensional stability in V-belts. And with Green Seal dimensionally stable belts you can be sure that matched sets are truly matched and will stay matched—that mismatching (the biggest problem in belting multiple drives successfully) is a thing of the past.

The key to dimensional stability lies in the tension members of the belt. For many years, steel cables as developed by Goodyear were the only length stable load carriers, but now they have been joined by synthetic cords, thanks to the amazing Triple-Tempered 3-T process.

The 3-T process is an exclusive method of tempering the cord with Tension, Temperature and Time for maximum strength and minimum change in dimensions. This assures no change in length during storage plus greatly increased shock- and stretch-resistance on the drive.

The end result is smoother, longer-running teams of belts that give you maximum, trouble-free, horsepower hours at minimum cost. What better reason for specifying V-belts with the Green Seal?

DIMENSIONALLY STABLE V-BELTS with the GREEN SEAL by

GOODYEAR

THE GREATEST NAME IN RUBBER

The Goodyear Tire & Rubber Company, Industrial Products Division, Dept. 794, Akron 16, Ohio

Please send me more information about how V-Belts with the Green Seal solve the major problem in belting multiple V-belt drives.

Name_____

Company_____

Street Address_____

City_____ Zone_____ State_____

Compass, E-C Cord, Hy-T, Green Seal—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

ROUGH TEST

for any valve

Good valves often fail on rotary drilling mud service—it takes a superior valve to stand up under the surging pressures and abrasive drilling fluids. For over 40 years, Rockwell-Nordstrom valves have proved superior on the roughest drilling services. Here's why they outperform other valves and do it at lower cost:

PROTECTED SEATING: Since the seats are fully protected within the valve body, abrasive mud and cuttings can't wear away vital surfaces.

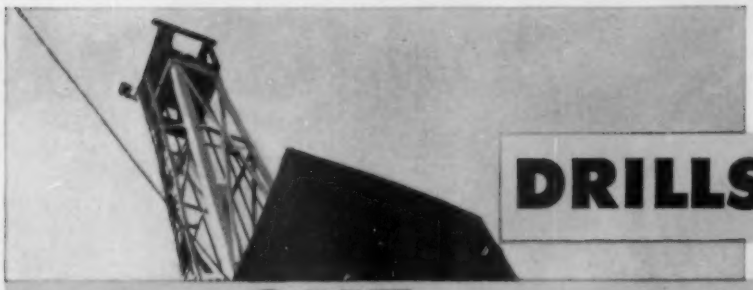
RUGGED DESIGN: The solid tapered plug, firmly seated in the body, is a far more rugged mechanism for taking the beating of pump surge than the threaded stems in ordinary valves.

LONGER LIFE, LOWER COST: The pressurized lubricant that assures positive shut-off is also preventive maintenance against costly down time and repairs.

Rockwell-Nordstrom valves are available in a complete line of sizes and pressures for every oil field need. They cost no more to buy, often less, than ordinary valves. For complete details, see your nearest supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed For
Positive Shut-off



DRILLS 12 WELLS WITH ONE TIGER BRAND ROPE

No sign of wear on this Tiger Brand Rope after 21,000 feet of drilling. Photo shows C. W. Morrison, Wire Rope Specialist and John Murry, Driller.

Out in Great Bend, Kansas, they drill wells fast and furious—sometimes going on and off location in ten days. The Hilton Drilling Company frequently drills from 10 to 12 wells with one 1050-foot length of Tiger Brand 1⅛" 6 x 19 Monitor Excellay Wire Rope with IWRC.

The rope on this rig has drilled six wells for a total of 21,000 feet and shows no sign of wear or fatigue. The driller, John Murry, says, "American Tiger Brand is the best line I have ever used."

Whether you are drilling shallow wells or deep wells, there's a Tiger Brand Rope that will give you the most service per dollar of cost. Write for our book on Tiger Brand Wire Rope for oilfield use.

Rig No. 2,
Hilton Drilling Company, Great Bend, Kansas.

PESA
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AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, Ohio
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS TRADE MARK

UNITED STATES STEEL

To help you produce
PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION
The future is the research engineer's today

oil cheaper P.E.S.A. members invest one hundred million dollars a year in **RESEARCH**

Jules Verne's "Eighty Days Around the World" was once regarded as a tale to stir the imagination of youngsters. But change outran Verne's imaginative story, making his predictions conservative indeed. Present day prophecies are even more breathtaking.

P.E.S.A. members are not startled at these fabulous prognostications, for their own scientists are predicting vaster things to come in the oil industry. They will not only keep up with the requirements of the industry but in many instances they will be ahead. We have only to look back twenty-five years to note the remarkable advances that have been made. Petroleum equipment manufacturers, supply companies, and service companies were in the vanguard of this progress.

The driving force of the free enterprise system is what has made these scientific conquests possible. The pioneering and inventive accomplishments of P.E.S.A. members year in and year out typify boldness and initiative in solving problems that would discourage lesser men.

The hundred million dollars a year that P.E.S.A. companies invest in research is assurance they will continue to develop new tools and methods and have them ready when and where needed.

Composed of: manufacturers whose plants make the finest precision equipment . . . *supply stores* who add two other ingredients of value—where you want it—when you want it . . . *service companies* who make available to their customers the practical results of the theoretical research of some of the most brilliant scientific and technical men in the world.

P.E.S.A.*

*Petroleum Equipment Suppliers Association

Experience!

'FABRICATED BY DELTA'.

Three words of growing importance to three great industries; Petroleum, Chemical and Petro-chemical.

'FABRICATED BY DELTA' is more than just an indication of a job completed, it's the effort and a desire to create a more efficient product than usually found in standard types. A desire to offer service that carries through to complete customer satisfaction.

'FABRICATED BY DELTA' means that there is a growing investment in plant capacity, the latest type of shop equipment, a staff of engineers imbued with a creative turn of mind...

'FABRICATED BY DELTA' means experience, know-how...and most important, customer satisfaction.

DELTA TANK MANUFACTURING COMPANY, INC.

BATON ROUGE, LOUISIANA

PLANTS: BATON ROUGE, LA. • MACON, GA. • BEARDSTOWN, ILL.

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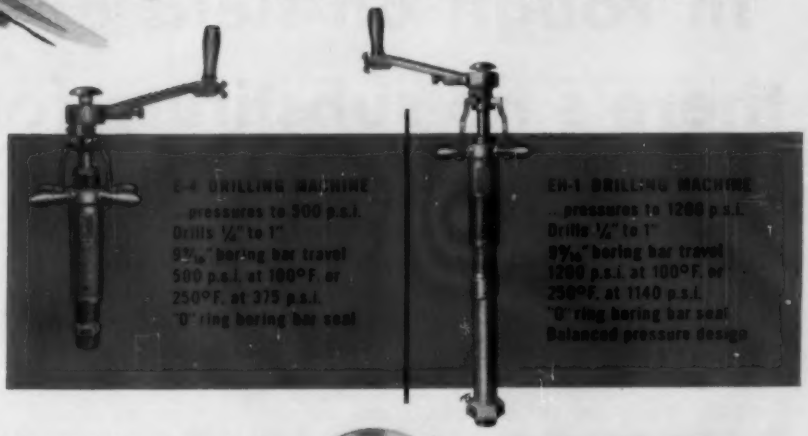
RUSH work order

Install
- tees ✓
- valve tees ✓
- nipples ✓
- fittings ✓

under pressure.

These Mueller NO-BLO® Fittings – tees, valve tees, line stopper fittings, drilling nipples – can be installed in a line, tank or processing system without interrupting flow. The key to low or high pressure taps, without halting operations, is the Mueller® E-4 or EH-1 Drilling Machine. Taps are made under pressure by using a gate valve between the machine and the pipe. Integral valves or plugs in the fittings keep the fluid under control. The E-4 or EH-1 can also make stop-offs to isolate a section for repair or additions.

NO-BLO®


E-4 DRILLING MACHINE
... pressures to 500 p.s.i.
Drills ¼" to 1"
9⅝" boring bar travel
500 p.s.i. at 100°F. or
250°F. at 375 p.s.i.
"O" ring boring bar seal
EH-1 DRILLING MACHINE
... pressures to 1200 p.s.i.
Drills ¼" to 1"
9⅝" boring bar travel
1200 p.s.i. at 100°F. or
250°F. at 1140 p.s.i.
"O" ring boring bar seal
Balanced pressure design

Your Mueller representative has more information on the versatile E-4 and EH-1 Drilling Machines and their matching NO-BLO Fittings. Ask him or write direct.

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

Since 1857

One of the Macks operated by H. L. Choate Trucking Company—an oil-field hauler from Alice, Texas. President Choate says...

"In rough oil-field operations... there's no substitute for a MACK"

"Thirty years in the oil fields have taught me that Macks are the only real truck buy. Their thrifty, steady work habits quickly make up for their higher initial price... they pile up year after year of money-making service long after so-called 'bargain' trucks are on the scrap heap. I've made my last experiment with buying cheaper trucks. For my money, there's no substitute for a Mack."

That's the way Mr. Choate, president of Choate Trucking, feels about Macks. And his oil-field operation certainly puts trucks to the test. Loads vary from 25,000 to 135,000 pounds. Hauling is often through swamps, heavy sand, gumbo mud, and over mountainous terrain. Yet Choate's Macks average 5 to 8 mpg of diesel fuel... running up 50,000 miles a year and plenty of winch time... with a minimum of down time.

Here's just one more example showing why it pays to operate the best. Your local Mack representative will gladly show you other on-the-job reports proving the same point. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

5152

Why does the BOURDON TUBE in the ASHCROFT DURAGAUGE insure sustained accuracy?

FOR FAST SERVICE, get in touch with your Industrial Supply Distributor. He is fully acquainted with Ashcroft Duragauges and their proper selection for all kinds of applications.

8 TUBE MATERIALS permit selection of the *best metal* for particular service conditions. These materials include phosphor bronze, alloy steels, "K" Monel, stainless steels, and beryllium copper.

Every Bourdon tube used in the Ashcroft Duragauge is extra-wide – highly sensitive to slight pressure changes. Socket and tip joints are welded or brazed, then stress relieved after assembly, to assure maximum safety and uniform structure for highest corrosion resistance and strength. Each tube assembly is "whip tested" at pulsating pressures approximately 50% higher than its pressure rating to insure calibration stability.

The Ashcroft Duragauge is available with all-stainless-steel movement or stainless steel with nylon bearings and pinion gear. A choice of case designs and materials, dial sizes and pressure ranges readily satisfy the most exacting requirements. Whatever the working pressures or corrosive conditions of your operations, specify Ashcroft Duragauges and be sure of highest sustained accuracy and long service life.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

ASHCROFT GAUGES

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Oklahoma.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

This is one way to protect pipe lines from rust and corrosion but . . .

It's Easier and Cheaper with UNICOR®

UNICOR, UOP's oil soluble corrosion inhibitor, gives dependable protection at suprisingly little cost. Actually only one molecule of Unicor is required for every million molecules of pipe line product. Its cost is only about $0.0005 per barrel of product.

It's economical to apply, too. Addition is made at only one point and since it is distributed evenly over the entire internal surface, protection is virtually 100% effective. There are important additional savings, too, from reduced scraper cleaning and filter replacement costs.

We will be glad to have our technical specialists assist you in the design, installation and operation of a Unicor system of protection.

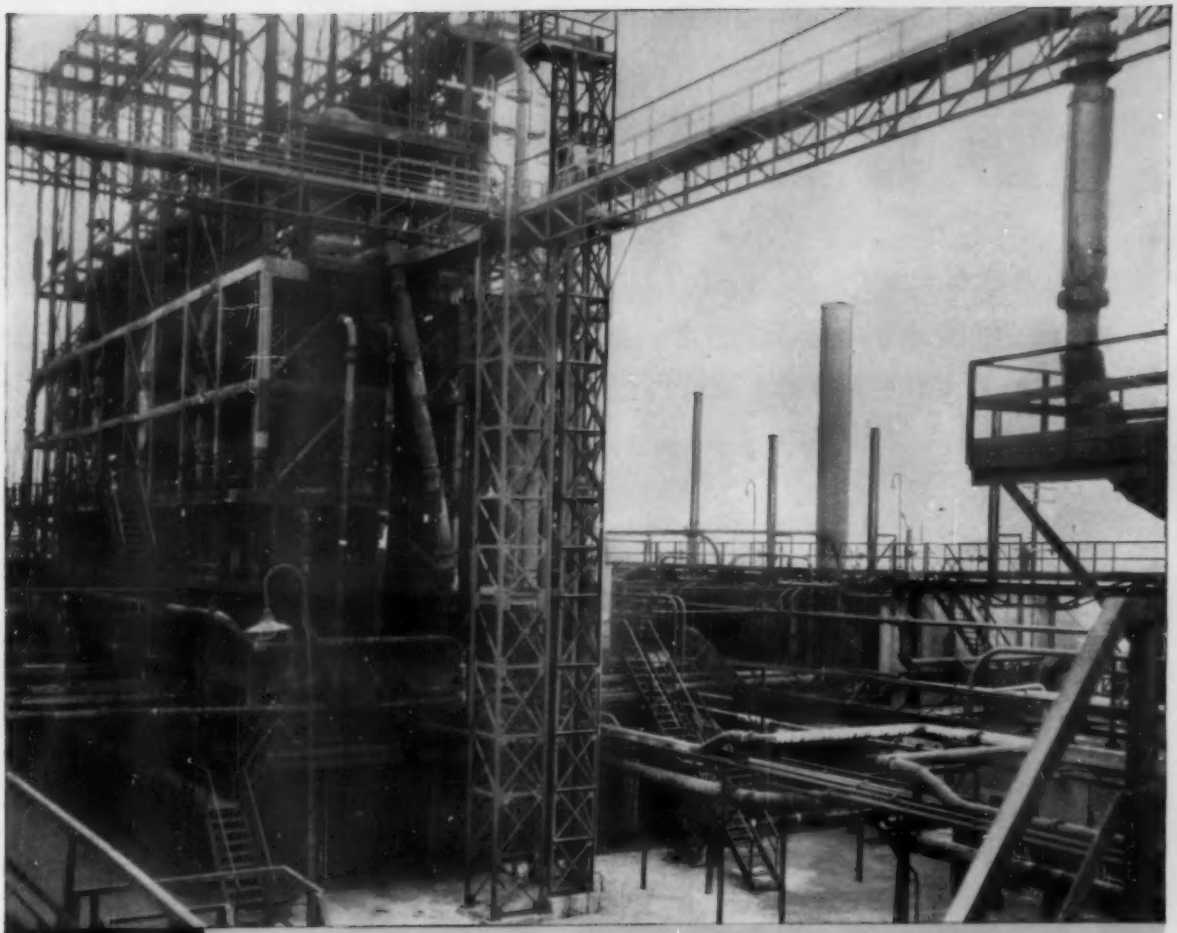
UNICOR is one of a number of UOP inhibitors and additives available to the refining industry. If you have a protection or preservation problem for product or transport facilities consult us.

PRODUCTS DEPARTMENT

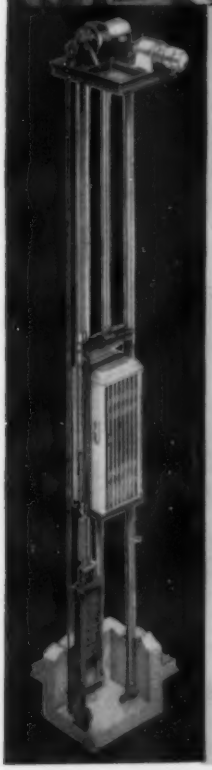
UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U. S. A.



A typical installation of an EHRSAM ELEVATOR at a Gulf Coast refinery.



Safe, Low Cost EHRSAM
ELECTRIC ELEVATOR FOR "CAT" CREWS

FACTS:
Complies with American Standard Safety Code, all state and local codes. Machinery and cab can be furnished galvanized for outdoor installation . . . lift rate, 90 ft. per minute. For special applications, speeds of from 50-120 ft. per minute are available.

SIZES:

2'3" x 2'3"	— 300 lb. capacity	(1½ Hp.)
2'9" x 2'9"	— 500 lb. capacity	(2 Hp.)
4' x 4'	— 1000 lb. capacity	(3 Hp.)
4'6" x 6'	— 2000 lb. capacity	(7½ Hp.)

Maximum lift 250 feet. All-metal car with collapsible door. Magnetic brake. Emergency exit and safety door. Rigid, electric-welded all-steel frame.

All components factory assembled and pre-tested for easy installation. Complete operating instructions and detailed drawings included with each unit. Furnished with all elevator safety equipment required by code. All electrical equipment can be furnished explosion proof for either 220 or 440 volts.

WRITE, WIRE OR PHONE FOR ILLUSTRATED BROCHURE AND LIST OF EHRSAM ELECTRIC ELEVATOR CUSTOMERS.

Push-button, car-type for 1 to 6 passengers.
Easy to run, inexpensive to operate, simple to install.

EHRSAM®

THE J. B. EHRSAM & SONS MFG. CO.

DEPT. OG, ENTERPRISE, KANSAS

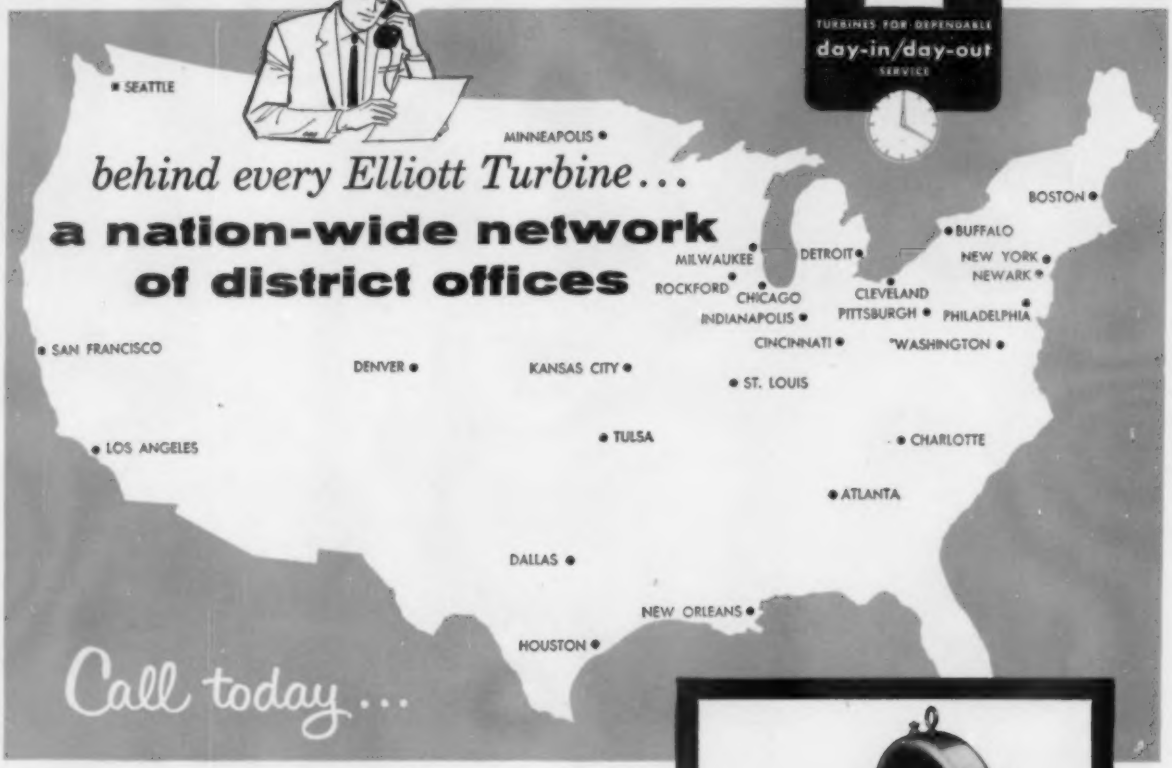
"OVER 80 YEARS OF DEPENDABLE SERVICE"

SALES OFFICES: Denver, Colorado; Fort Worth, Texas; Kansas City, Kansas.
WEST COAST: Ehrsam Pacific, Inc., Riverside, California.

TURBINES FOR DEPENDABLE
day-in/day-out
SERVICE

behind every Elliott Turbine...

a nation-wide network of district offices



for application engineering

for operating recommendations

for maintenance service

You don't have to wait several days or even weeks for a delayed mail reply or for a turbine service engineer from a distant head office. Near every Elliott turbine installation—and thousands of Elliott turbines are in operation in process industries everywhere—you'll find an Elliott District Office providing *prompt, fast and efficient service.* Time-consuming red tape and complicated approval systems are strictly taboo.

the Elliott man in the Elliott district office is thoroughly trained to furnish designing specifications, application data, and complete costs on Elliott turbines, from the smallest single-stage to large multi-stage types. He is an engineering expert, fully capable of diagnosing your operating difficulties and of planning an effective maintenance program. Call him today.

The Elliott "Planned Maintenance" Program eliminates need for large costly inventories

Since YR turbine wearing parts are completely interchangeable, a stock of spares for each turbine is unnecessary. The Elliott field engineer will help you analyze minimum replacement requirements. Ask him for Bulletin H-23, or if you prefer, write Elliott Company, Steam Turbine Department, Jeannette, Pa.

H7-4

ELLIOTT Company

Steam Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Centrifugal Compressors • Turbochargers • Tube Cleaners • Strainers

one step ahead!

How is your expansion program doing? Has it been delayed? Is it scheduled to begin soon? Regardless of the time factor, Parsons' Technical Planning Services* plus design†, procurement and construction are available to Industry and Government *with the future in mind.* By taking advantage of these services *now,* your facilities will be ready—when you want them—where you want them—the way you want them—to put you *one step ahead of the field.*

**Technical Planning Services include Economic Studies and Appraisals, Geological Surveys, Raw Material Investigations, Site Selection, Master Planning, Research and Development, Pilot Plant Studies, and Criteria development.*

†*Process, Mechanical, Electrical, Structural, Civil and other engineering services.*

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LOS ANGELES

Economical Pumping With "46" Rods From 6000 ft in North Dakota

They're getting steady, economical pumping with Bethlehem "46" Sucker Rods in the Nodana Petroleum Corp. Well No. 1, near Tioga, N. D. The well, originally drilled to 8150 ft but currently pumping from the 6000-ft level, is part of the F. E. McCoy Lease in the McGregor Field. Its output from the Madison formation is 100 bpd of 42-gravity oil and water.

The sucker rod string consists of ¾-in. and ⅞-in. "46" rods. It is equipped with Bethlehem Maxiflow couplings and Huber scrapers, and operates in 2-in. tubing. The Bethlehem pumping unit, a 228-D-25S-74, uses a 74-in. stroke at 14 spm.

The Bethlehem "46" Sucker Rod is made of a good grade of nickel-molybdenum steel. It is both fully normalized and fully tempered, and is just the type of rod you need for dependable service in heavy-pumping duty.

In addition to the "46," Bethlehem makes other types of carbon and alloy rods, making it easy for you to select a type best suited to a particular fluid condition. We also produce a full line of sucker rod accessories. For information, contact your Bethlehem sucker rod distributor.

COLOR MOVIE ON FASTENERS

See the story of fastener manufacture in our color film, "Holding Power." 16 mm, with sound. Showing time, 25 minutes. If you would like to borrow a print, please write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

GUIBERSON DRILL PIPE PROTECTOR RUBBERS

Stay Put.. Keep Their Grip.. Keep Their Size..

Guiberson drill pipe protector rubbers show their quality when we first put them on your pipe. And in the hole, they *stay put.* They can work in high temperatures or in oil base drilling muds— take a powerful amount of wear and abuse. *They keep their grip.*

You get extra casing protection and extra performance from Guiberson protector rubbers because they're made from a special wear-resisting rubber compound, designed for universal application in all kinds of drilling. And you get it because Guiberson just plain *knows how* to mold and compound rubber products that can take the tough jobs in today's wells — and lick them.

That extra rubber know-how comes from Guiberson's long years of experience in manufacturing rubber products specifically for the oil industry. It comes from a rubber plant and laboratory staffed and equipped to do the specialized job right. When you want drill pipe protectors that won't walk and do maintain their original OD for a long, useful life, look to Guiberson for the answer.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

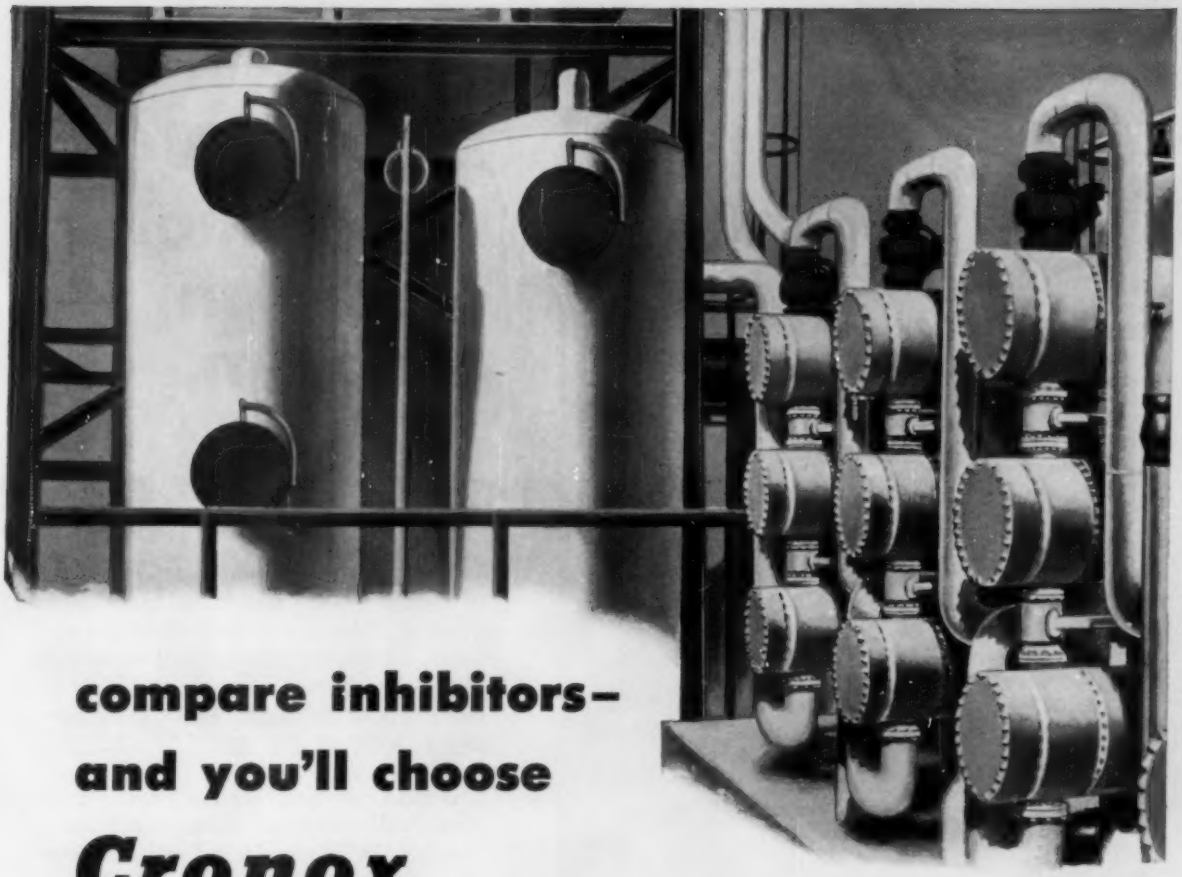
Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.



compare inhibitors– and you'll choose *Cronox*

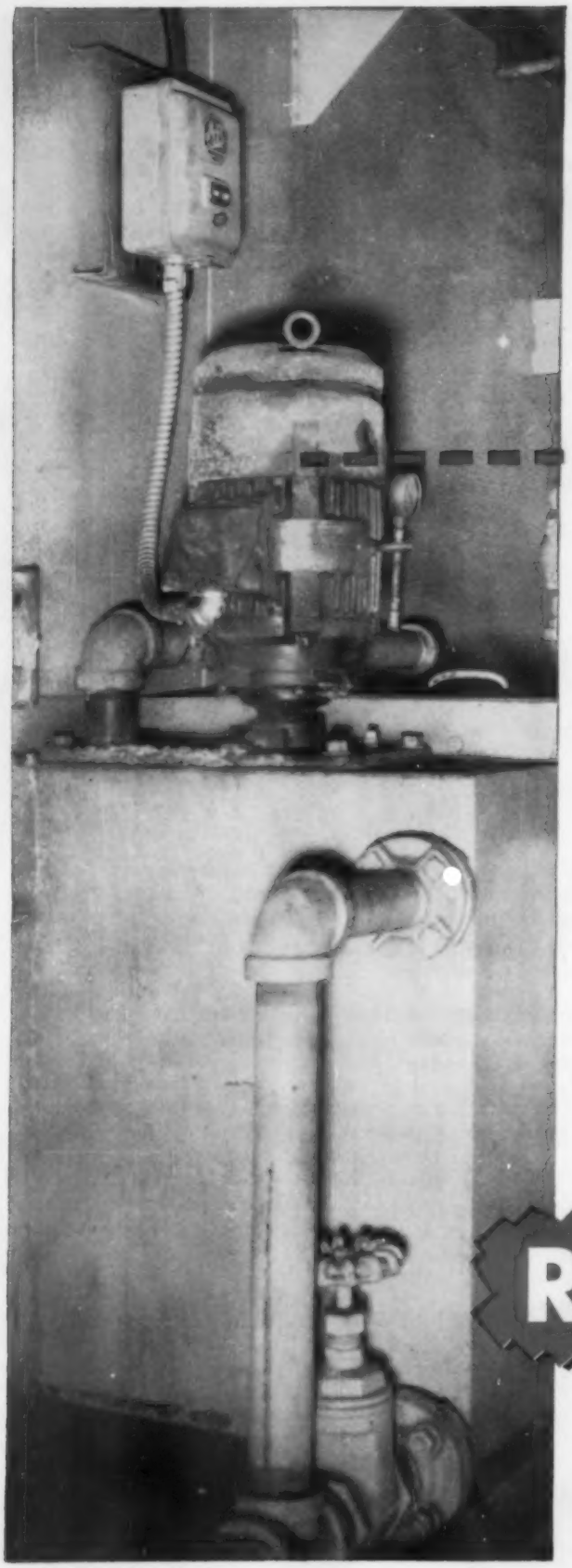
How long has it been since you gave your refinery corrosion protection program a thorough evaluation? Unless you're using the latest in inhibitors, you may be missing the chance to get the big savings that modern protection can give you.

Compare CRONOX inhibitors for *effectiveness*. You'll find that they produce a film which controls pitting, fouling and blistering.

Compare them for *economy*. Injection rates of 6 to 9 ppm give lasting protection in most applications.

Call Aquaness today, for a consultation on your specific corrosion problems, and for a recommendation of the most effective Aquaness inhibitor from our versatile line.

Chemicals for Refining, Gasoline Plants and Oil Transportation



RELIANCE solves motor corrosion problem

This Reliance Corrosion-Proof Motor is operating a pump which circulates cleaning solution through a tank containing metal parts. The motor is subjected to corrosive vapors and liquids each time a basket of parts is removed. BUT THIS MOTOR WILL NOT CORRODE.

The solid cast-iron housing, including the fan cover, will withstand corrosive service indefinitely. Wiring identification is preserved on a stainless steel name plate. A threaded outlet is provided on the water tight conduit box, and motor leads are molded into a neoprene gasket that completely seals off the windings from the conduit box. A neoprene or non-ferrous shaft slinger seals the only other frame opening.

These and many other features give you a motor with a built-in corrosion protection. Why not install this superior design now and save many replacement dollars in the years ahead.

Write for bulletin B-2406 for complete design details.

B-1658

R

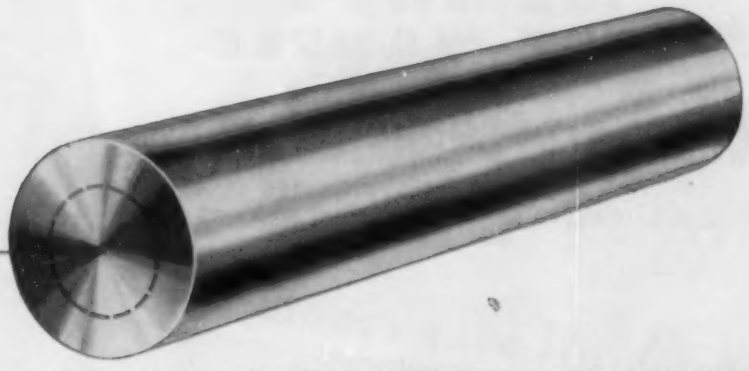
RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 106A, CLEVELAND 10, OHIO
CANADIAN DIVISION: WELLAND, ONTARIO

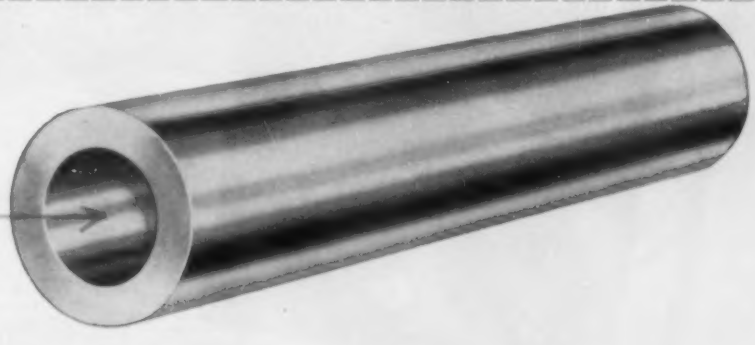
Sales Offices and Distributors in Principal Cities

Buying bar stock for hollow parts?

Why pay for all this steel



When you can start with this?



Buy TIMKEN® seamless steel tubing

If you're making hollow parts, and bore cut *solid* bar stock, you're paying for steel you don't use. But Timken® seamless steel tubing comes with *the hole already there.* You pay only for steel you use. On top of this saving, you cut machining costs. By eliminating that unnecessary boring operation, you free part of your screw machines for other jobs—add machining capacity without adding machines.

Our engineers will be glad to recommend the most economical tube size for your hollow parts job. By studying your problem and making recommendations, they'll save you money—and the Timken seamless steel tubing they suggest will be guaranteed to clean up to your finished dimensions.

The piercing process by which Timken seamless steel tubing is made is basically a forging operation. You get *fine forged quality*—a uniform spiral grain flow for greater strength, and a refined grain structure. And through our rigid quality control uniform quality is maintained from tube to tube, heat to heat and order to order.

The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U. S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

See them Now!

Industry's MOST WANTED line of GENERAL PURPOSE VALVES

FOR PETROLEUM REFINERIES
CHEMICAL PLANTS • POWER PLANTS

Write for Supplement No. 1 to Catalog F-9

Address Dept. 24A-FO

MOST WANTED — that's right — because the G P line includes gate, globe, and angle type valves having seats faced with **HAYNES STELLITE*** alloy or other hard facing alloys for greater seat-wear resistance . . . at no extra cost!

Hard faced seats, in combination with precision finished, selectively hardened discs and wedges give these valves amazing resistance to erosion, corrosion and galling. That's why they are setting new standards of performance in steam, water, oil, or gas services at the recommended pressures and temperatures.

Get longer, drop-tight, service life with minimum maintenance by specifying Vogt G P Valves. Available in a complete range of sizes from ¼" to 2" and rated 800 pounds at 850°F. and 2000 pounds at 100°F.

HENRY VOGT MACHINE CO.
P. O. Box 1918—Louisville 1, Ky.

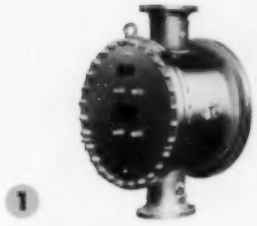
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati, San Francisco

Vogt — GENERAL GP PURPOSE — Vogt FOR BETTER VALVES

DROP FORGED STEEL

VALVES

*Trade-Mark of Union Carbide and Carbon Corporation



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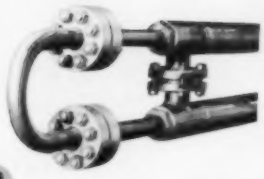

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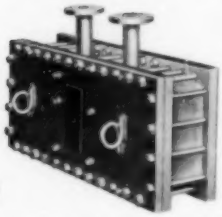

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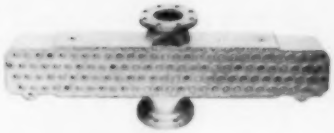

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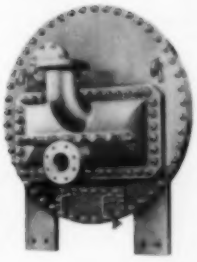

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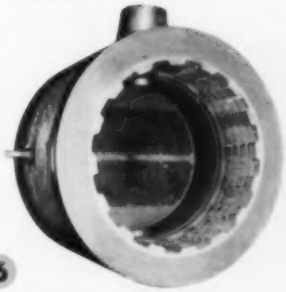

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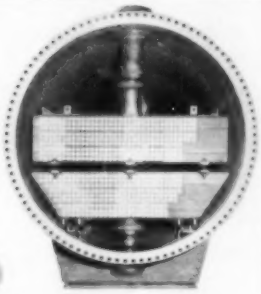

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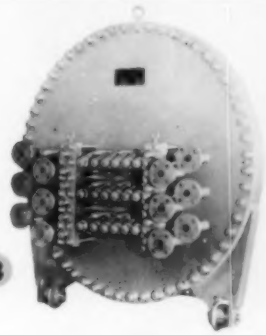


8

How many of these heads do you recognize

...they all belong to G-R heat transfer units

These are the heads of some of the many different types of heat transfer apparatus available from G-R. They indicate the wide range of G-R units . . . for condensing, cooling, heating or heat exchange . . . for any liquid, vapor or gas . . . for any capacity, pressure and temperature.

G-R designs and recommendations are backed by 90 years of G-R experience, the results of G-R continuous research and product improvement, and the performance records of many thousands of G-R installations throughout industry and all over the world.

Get the benefit of these assurances of authoritative advice and successful service for your particular heat transfer requirements. There's a helpful G-R representative near you. Write us about your needs and he will promptly get in touch with you.

1. Tubular Heat Exchanger, for a great variety of services in transferring heat from one fluid to another

2. Twin G-Fin Section, a unit with a wider range of heat transfer services than any other design on the market

3. Air and Gas Cooler, for cooling the air or hydrogen from generator windings and for other gas cooling or heating services

4. Atmospheric Open Section, with Bentube or K-Fin elements for cooling or condensing services

5. Type R Evaporator, for producing distilled boiler feed make-up at moderate pressures

6. Type L Feedwater Heater, for the highest pressures encountered in central power generating stations

7. Type J-2 Evaporator, for producing large quantities of boiler feed make-up at high pressure

8. Steam Generator, using waste heat to produce steam at boiler pressure

THE GRISCOM-RUSSELL CO.

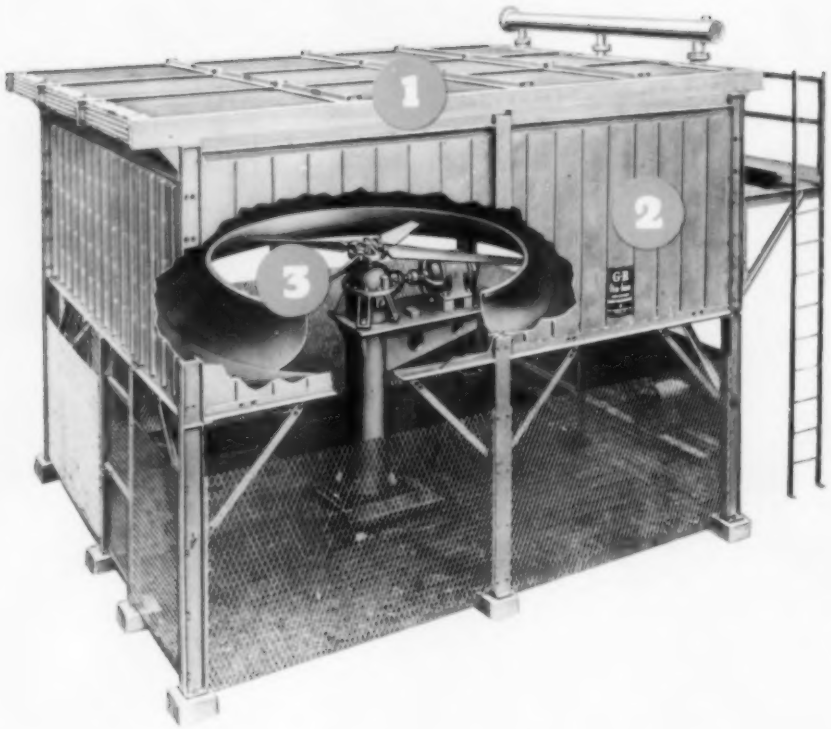
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

MASSILLON, OHIO

GR 269

fin-fan

the Sturdy air-cooled heat exchanger



1 Sturdy K-Fin Cooling Sections

Designed for the highest pressures and temperatures encountered in cooling and condensing services, and for corrosive fluids—even hot liquid metal. Installations are operating at pressures up to 5,000 psi and temperatures up to 1,200 F.

2 Sturdy Structure

Built to withstand a wind load of 40 lb per sq ft, equivalent to a wind velocity of 100 mph; and can be designed to withstand earthquakes.

3 Sturdy Drive Mechanism

Driving units and speed reducers are specially designed for heavy-duty continuous operation, and are mounted on a sturdy pedestal with its own foundation, independent of the structure, for elimination of vibration.

You can confidently use G-R **fin-fan** for severe service conditions such as are often met in petrochemical plants and petroleum refineries. In addition to the exceptional sturdiness of every part of the unit, the design includes provisions for close temperature control and air-flow control, complete protection of operators and equipment, and wide selection of arrangements to suit plant conditions and operating requirements.

Write for complete information.

THE GRISCOM-RUSSELL CO.

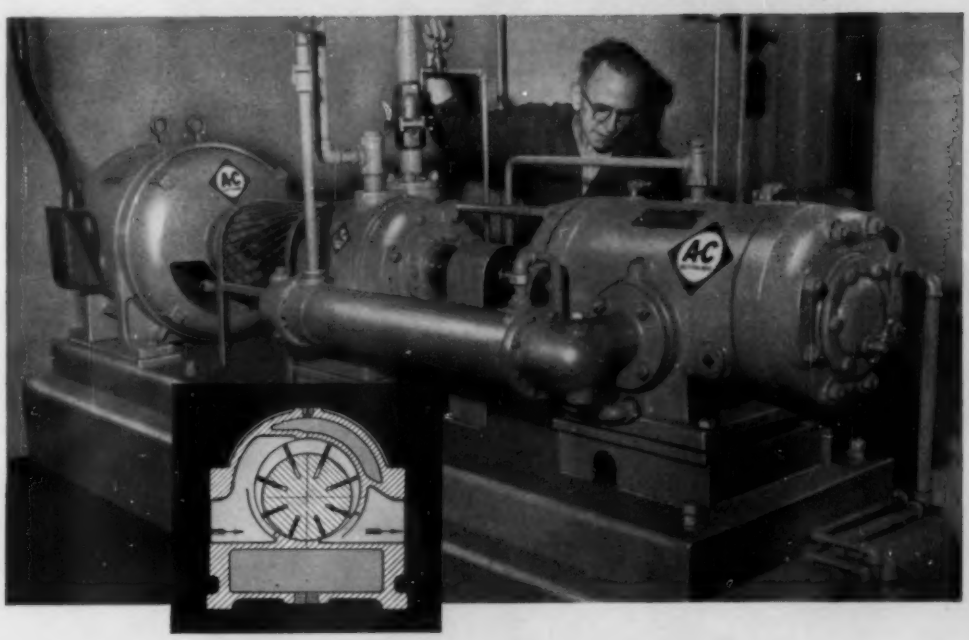
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

MASSILLON, OHIO

GR272

RO-FLO

Compressors cut vibration . . . eliminate wear and tear



Low maintenance is one of 4 advantages

ROTARY motion and fewer parts reduce maintenance costs to a minimum. Lack of vibration and shock, plus the absence of reciprocating parts — pistons, valves, connecting rods — eliminates major causes of trouble.

Other advantages are:

Constant efficiency — During operation the sliding vanes of the rotor press outward against the cylinder wall to form air cells (as shown in drawing). The rotating force holds vanes tightly against the cylinder wall under all conditions, and air cell size, air flow, and efficiency always remain constant.

Compactness — No extra weight or size needed to dampen vibration.

Low-cost foundations — Smooth operation eliminates need for heavy, costly foundations. Small units are bolted directly to floor . . . large units need only a simple slab.

Many Types and Sizes

Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm. Two-stage units for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge.

Single and two-stage vacuum pumps for vacuums to 0.3 inch mercury absolute from 22 to 5950 cfm.

For Information — Call your nearby A-C office or write for Bulletin 16B8244 (two-stage) and 16B-8126 (single-stage). Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

Ro-Flo is an Allis-Chalmers trademark

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5354

CP's advanced design, research, and manufacturing techniques develop bits that combine the most effective tooth patterns with the heaviest bearings on the market. There's a CP bit for every type formation.

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Cost-cutting Performance

THREE CONE BITS • REAMING BITS • REAMERS • DRILL COLLARS • TOOL JOINTS • SUBS • JUNK BASKETS

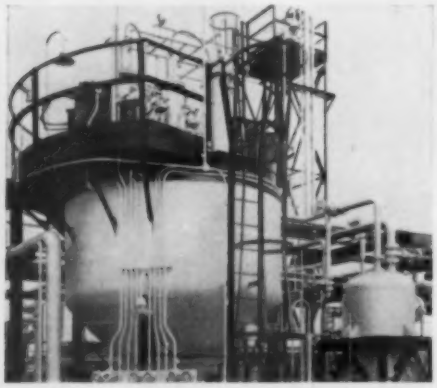
ARE YOU STILL TREATING MOTOR LUBRICANTS WITH HORSE AND BUGGY PROCESSING?

PETRECO Lube Oil Treating outmodes conventional treating systems, such as batch and centrifugal. It is as modern as the engines in which the lube oil will be used. It is automatic, precision-controlled, continuous.

PETRECO LUBE OIL TREATING CHANGES LUBE TREATING FROM AN "ART" TO A *SCIENCE.*

HERE'S HOW

Petreco treating eliminates guesswork. It eliminates the problems and uncertainties of gravity settling. It incorporates the many advantages of automation. With Petreco Electrofining equipment in the lube treating scheme, the lube stock is intimately contacted with acid, permitting the use of less acid. *(The acid used is made to work harder.)* Intimacy of contact is possible with Petreco because all the elements in the treatment, temperature, pressure, amount of acid, degree of mixing intensity, and contact time are predetermined and automatically controlled. The acid-lube oil contact time is precise because, with Petreco, separation is "right now".



Petreco Lube Oil Treaters are currently in use by two of the largest refiners in the United States. Reported advantages of Petreco lube oil treating are:

1. *Continuous*
2. *Automatic*
3. *Minimum Contact Time*
4. *Lower Acid Requirements*
5. *Re-use of Acid Sludge*
6. *Oil Not Exposed to Atmosphere*
7. *Sludge Can Be Pumped*
8. *Negligible Oil Entrainment in Sludge*
9. *Minimized Sludge Disposal Problem*
10. *Low Operating and Maintenance Costs*
11. *Employee Training Simplified*
12. *No Air Pollution*

Installed cost of Petreco lube treaters is low—ranging from around $60 to $100 per barrel of daily throughput. Get better lube products, with less operating attention, low capital investment, minimum operating costs—*GET PETRECO.*

WRITE TODAY for the Petreco Lube Oil Treating Booklet. Complete information is yours for the asking...

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A DIVISION OF PETROLITE CORPORATION

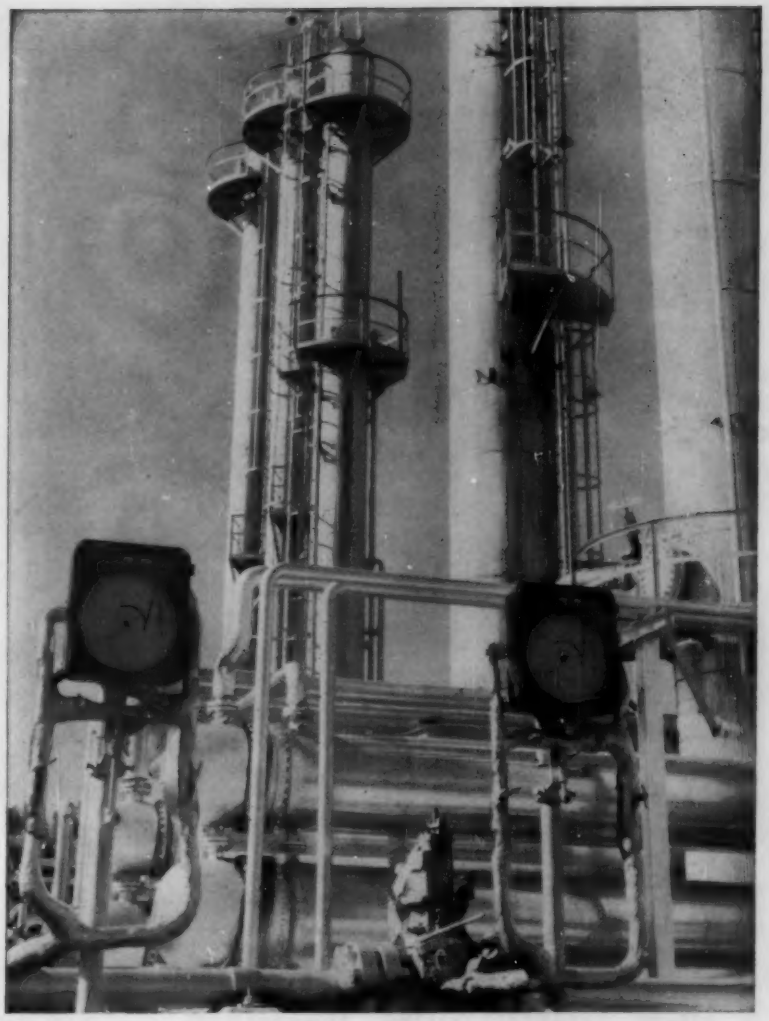
3202 S. Wayside Drive, Houston 1, Texas • 1390 East Burnett St., Long Beach 7, California

Specialized Electric Petroleum Treating

DESALTING • DEHYDRATING • CAUSTIC WASHING • ACID TREATING • DOCTOR TREATING • SWEETENING • NAPHTHENIC ACID REMOVAL • SEDIMENT REMOVAL

DT-57-6

Rockwell Orifice Meters and Chart Drives



Weather Proofed AGAINST

HEAT • COLD • ABRASION • CORROSION

CORROSION RESISTANT MATERIALS, inside and out, make Rockwell gauges and chart drives perform best "off-shore," on sour gas and in corrosive atmospheres.

SEALED INSTRUMENT CASES guard these precise mechanisms against contaminating outside influences such as moisture, sand and wind.

UNIQUE LUBRICATION of bearing surfaces and pivot points assures uniformly free performance in tropic heat and arctic cold.

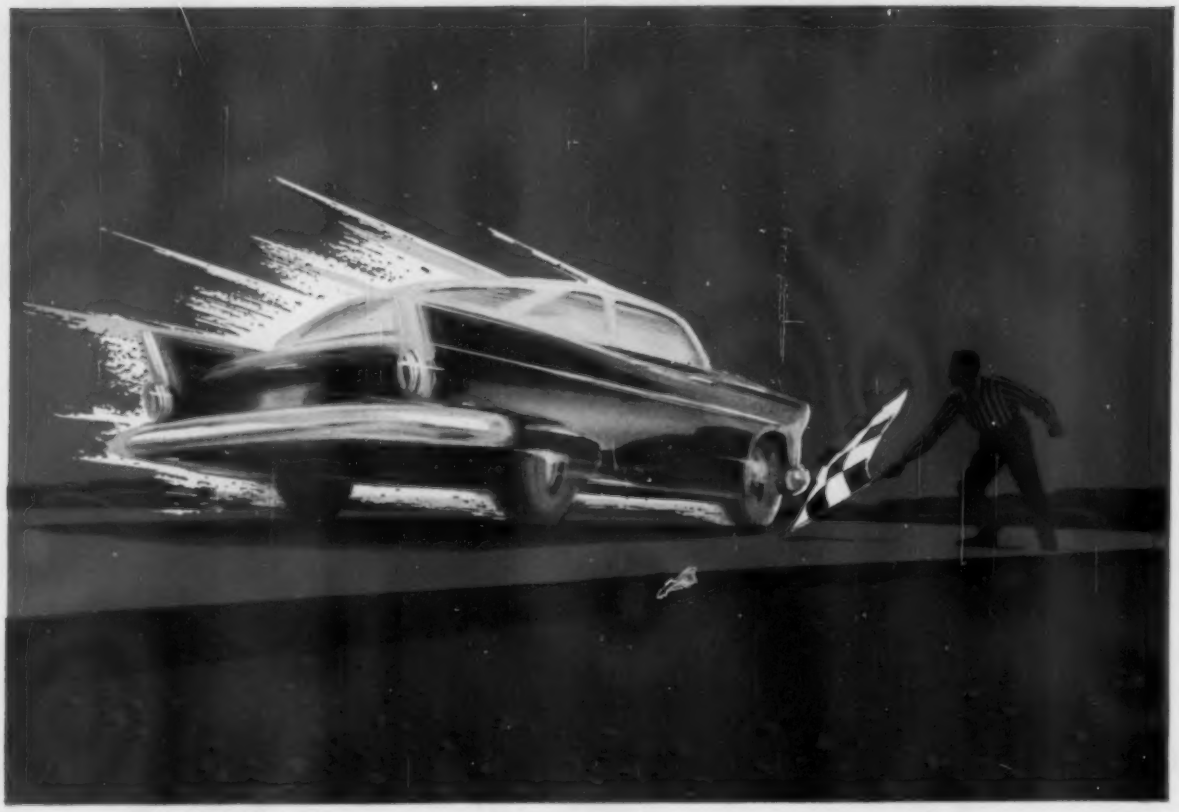
BETTER ENGINEERING AND DESIGN is your cue to the better performance you can expect from these Rockwell products on any service, under any conditions.

Write for bulletins

ROCKWELL MANUFACTURING COMPANY

INSTRUMENT DIVISION BOX 2396, TULSA, OKLA.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Texas New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario



For those new, higher compression engines... a new Catforming catalyst

The trend to higher compression engines is here to stay. And wide-awake refiners have to produce fuels to suit these up-to-the-minute engines.

Atlantic is proud to offer an advanced Catforming catalyst designed to economically produce higher octane gasolines . . . *and it can be utilized in your present equipment.* For more information, write, wire or call The Atlantic Refining Company, P. O. Box 8138, Philadelphia 1, Pennsylvania.

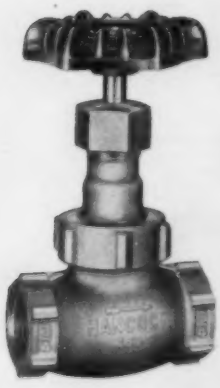
Higher gasoline octanes through Pentafining

You can convert the low-quality n-paraffins (C_5, C_6, C_7) in your gasoline pool to high octanes! Pentafining, the process developed by The Atlantic Refining Company, makes it possible. For full particulars, write today to The Atlantic Refining Company, P. O. Box 8138, Philadelphia 1, Pennsylvania.

It's the CATALYST that counts

ATLANTIC

THIS "ACT" COSTS $10.00 AN HOUR . . . AND IT'S NO COMEDY!



Maintenance costs today make ordinary bronze valves an expensive gamble. Such valves with renewable composition seats and discs require frequent maintenance – piping systems out of service – unnecessary labor. And, the cost of a new disc is only the beginning!

You can eliminate both the expense and the problem. Use Hancock Bronze Valves with *superhard* "500 Brinell" stainless steel seats and discs. They last throughout the life of the valve – won't wire-draw, steam-cut or gall.

Be sure of highest efficiency and lowest maintenance. *Specify Hancock Bronze Valves!* Sizes range from ¼" through 2" in globe and angle types, with screwed ends – for all pressures up to 300 psi at 550° F.

PHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for complete information about Hancock Bronze Valves. He is always ready to give you quick service.

When Hancocks go in, valve costs go down

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

HANCOCK VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** Watertown 72, Massachusetts

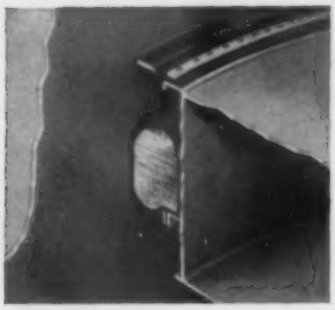
MAKERS OF 'ASHCROFT' GAUGES, 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'CONSOLIDATED' SAFETY VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Okla.* AIRCRAFT CONTROL PRODUCTS, *Danbury, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

every oil operator wants to know

HOW TO PREVENT LIGHTNING FIRES IN TANKS

the answer is now available

USE HAMMOND TUBESEAL* FLOATING ROOFS!

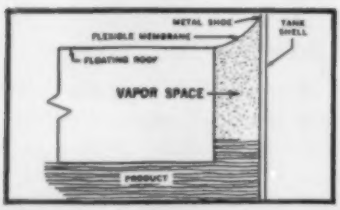


TUBESEALS are made lightning-proof with their exclusive electric conductor weather seal.[1] This specially compounded synthetic rubber, extending continuously around the entire perimeter, between roof and tank shell, provides an infinite number of contact points. ELABORATE TESTING by an independent laboratory[2] discloses that the seal prevents isolation and collection of static electricity charges, providing a continuous conductive surface with large current carrying capacity. Induced charges from lightning are immediately dissipated and fires are prevented. There are no mechanical contacts to cause sparking.

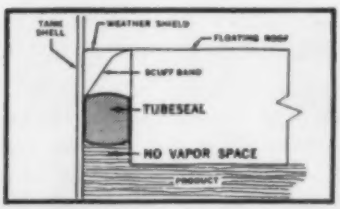
WITHOUT VAPOR THERE CAN BE NO FIRES **. . . the inherent design and construction of Hammond Tubeseals eliminates space between roof, shell, and liquid; thus, there is no room for vapor to form . . . no vapor . . . no fires . . . no evaporation . . . no corrosion!**

Introduced to the oil industry late in 1955, the Hammond Tubeseal found immediate favor with oil companies all over the world . . . there are now more than 200 installations in operation and building. A measure of their conservation values and fireproof features is illustrated by their record of repeat orders from satisfied users—one large oil company, after several test installations, re-ordered more than a score of Tubeseals. The same story of satisfaction exists wherever a Tubeseal is in operation.

Write for bulletin TS



CONVENTIONAL FLOATING ROOF tank has space below flexible membrane where air-vapor mixtures form. Because metal shoe and membrane cannot be absolutely gas tight, vapor is constantly escaping. This condition causes excessive corrosion, may also result in rim fires from lightning or other source.



HAMMOND TUBESEAL FLOATING ROOF entirely eliminates every space where air-vapor mixtures can form. Hammond Tubeseal completely fills space between product surface and roof seal, so that corrosion is stopped (even for sour crudes), and vapor cannot form—hence cannot ignite or be lost.

THE HAMMOND TUBESEAL
for new or old floating roof tanks,

FEATURES

- **lightning and fire proof construction**
- **no moving parts**
- **no mechanical maintenance**
- **climate-proof**
- **non-corrodible**
- **can operate to bottom of tank or above the top**
- **no vapor space below the seal**
- **entire circumference has tight seal under pressure at all times**
- **longer working life expectancy**

*Patented [1]patent pending [2]names on request

HAMMOND TUBESEAL — THE MOST EFFICIENT AND POSITIVE SEAL KNOWN

HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH • CASPER, WYO. • BIRMINGHAM, ALA.

Sales Offices:

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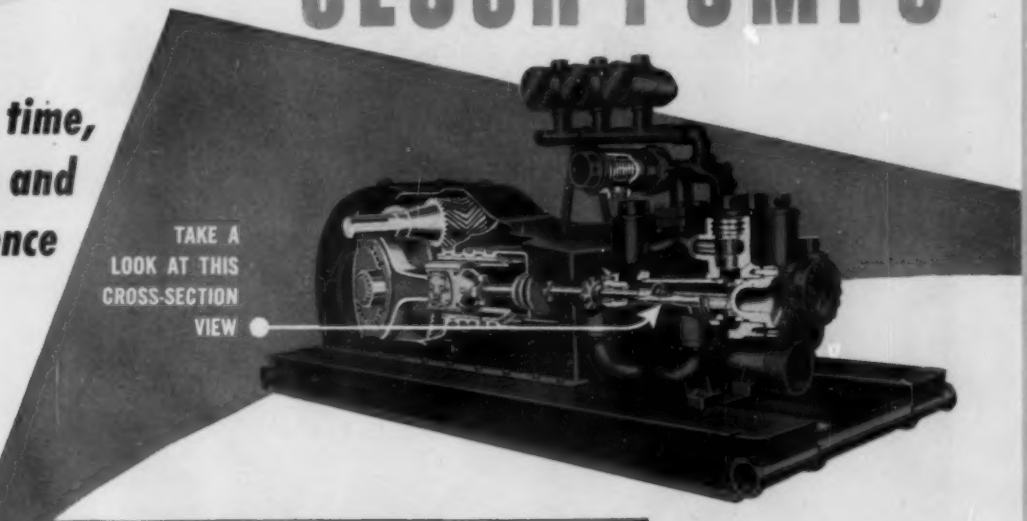
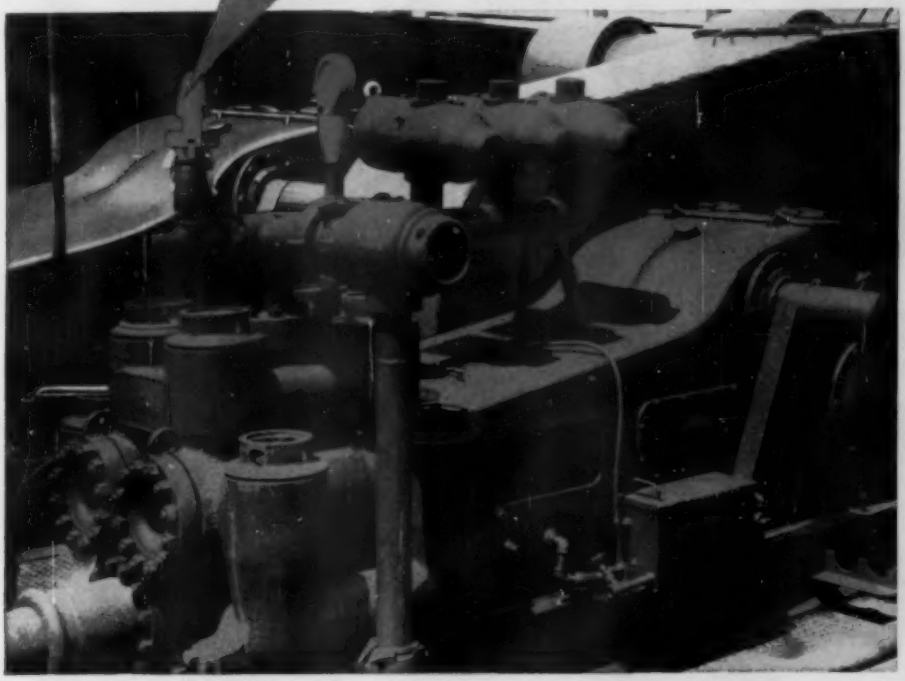
Licensees: CALIFORNIA, CANADA, ENGLAND, BELGIUM, GERMANY, ITALY, FRANCE, AUSTRALIA, JAPAN

THE PATENTED *"Exposed"* LINER DESIGN OF

CONTINENTAL-EMSCO SLUSH PUMPS

saves you time, money and inconvenience





One of the many exclusive and superior advantages of the Continental-Emsco Slush Pump is the patented "exposed" liner design. This eliminates all fluid washouts caused by lining packing failure since the slightest leak may be detected immediately.

Continental-Emsco Slush Pumps deliver more horsepower per pound than any other make. Lubrication is completely automatic. There are no adjustments to be made—no greasing to be done. Wide-faced, forged steel, heat-treated herringbone gears provide efficient speed reduction. These features are available in all 6 sizes of Continental-Emsco Slush Pumps.

Distributors: Bovaird Supply Company, Tulsa, Okla.
Mid-Continent Supply Company, Fort Worth, Texas

Export Distributor: Mid-Continent Supply Co., Inc.
45 Rockefeller Plaza, New York 20, N.Y.

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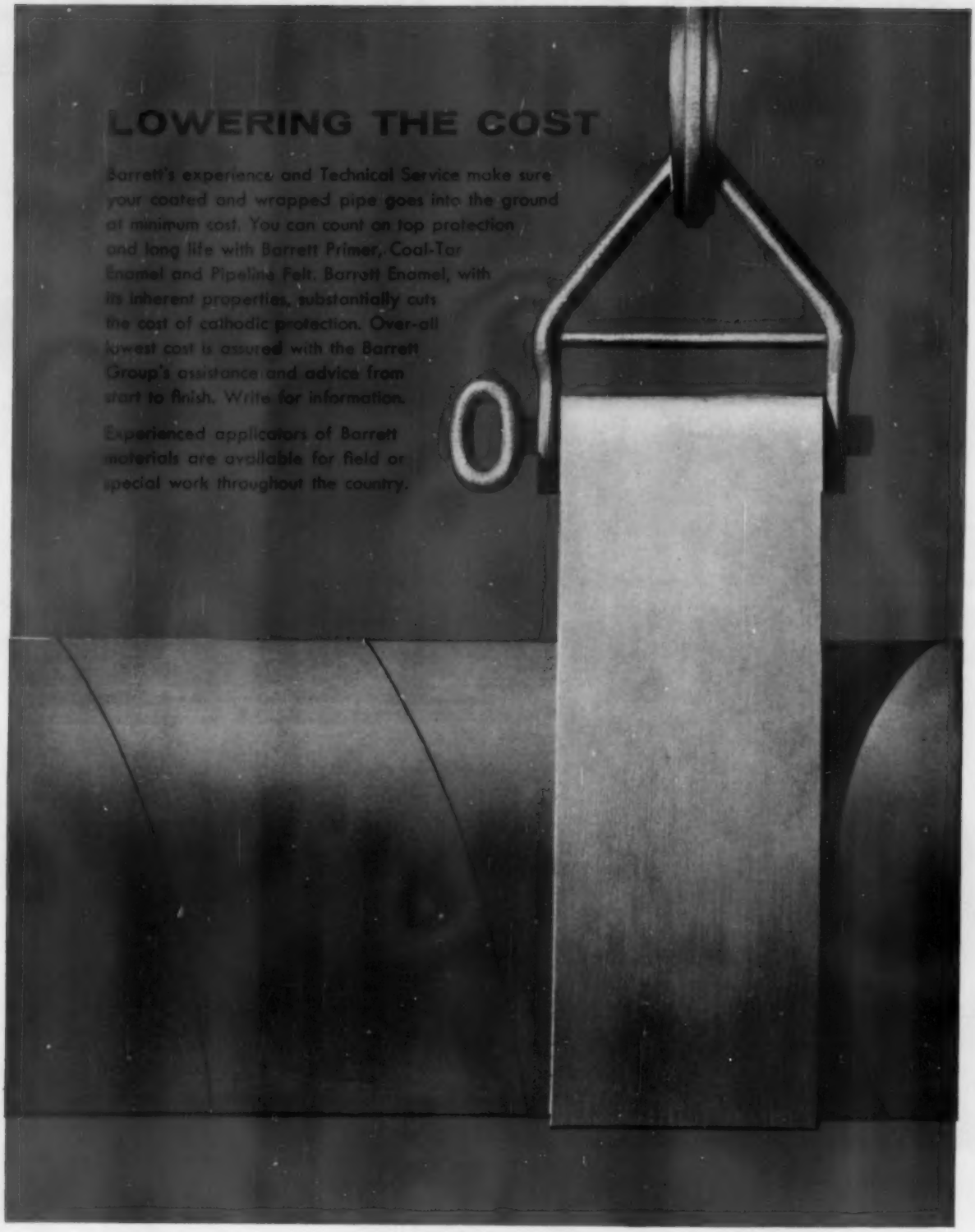
CONTINENTAL-EMSCO COMPANY

A Division of The Youngstown Sheet and Tube Company

General Offices: DALLAS, TEXAS • Plants: LOS ANGELES • HOUSTON • GARLAND, TEXAS

Representatives in All Principal Oil Fields of the World

SP-704


LOWERING THE COST
Barrett's experience and Technical Service make sure your coated and wrapped pipe goes into the ground at minimum cost. You can count on top protection and long life with Barrett Primer, Coal-Tar Enamel and Pipeline Felt. Barrett Enamel, with its inherent properties, substantially cuts the cost of cathodic protection. Over-all lowest cost is assured with the Barrett Group's assistance and advice from start to finish. Write for information.
Experienced applicators of Barrett materials are available for field or special work throughout the country.

Barrett

PROTECTIVE COATINGS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

Allied Chemical

OVER 100 YEARS OF EXPERIENCE

Roebling Royal Blue Wire Rope will **bend** and **bend** and **bend!**

What's more, Roebling Royal Blue is *stronger* than the strongest wire rope previously available. It will do more work and last longer on *your* job. Call your distributor or your nearest Roebling office for full information about Royal Blue, the really better wire rope. John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Distributors, Branches and Warehouses Throughout the Country—Subsidiary of The Colorado Fuel and Iron Corporation

solid foundation...

A Halliburton cement job is a solid foundation for protecting your casing by reducing danger of...

- corrosive action of mineralized waters or stray earth currents
- external pressures which may cause casing to collapse
- high pressure gas zones behind casing which may cause blowout

Since casing represents one of the major investments you make in your well, it demands first-rate protection against these forces. First-rate protection to experienced oilmen means Halliburton cementing. That's why well owners have ordered Halliburton cementing service on more than 2,000,000 cementing jobs.

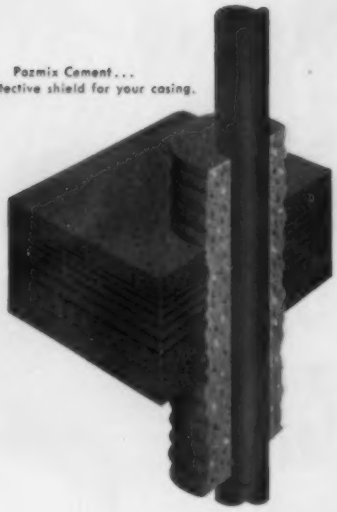
Give your casing the protection of Halliburton cementing. A Halliburton crew is only minutes away from your well, and can add extra years of economical productivity.

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

HALLIBURTON-DEVELOPED PRODUCTS SET THE STANDARD FOR CEMENTING



Pozmix Cement... the protective shield for your casing.

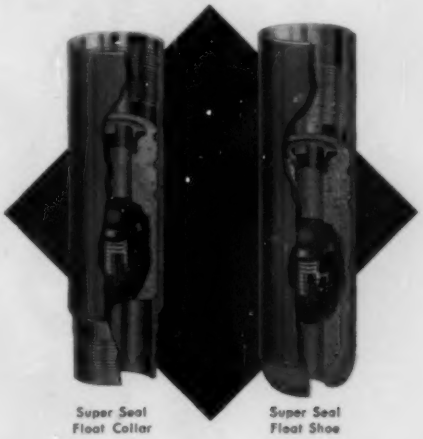
POZMIX CEMENT... possesses properties which makes it superior to conventional portland cements for cementing surface pipe, intermediate and oil strings over a wide range of temperatures from near freezing to the hottest wells encountered:

- Slurry is lighter in weight, easier to pump
- Highly resistant to sulfate and salt water corrosion
- Perforates with less shattering
- More economical than regular cement, yet durability is greater.

Pozmix cement combined with Halliburton's variety of accelerators, retarders, fluid loss and weight control additives provides precision control and excellent results for a wide range of primary and remedial cementing.

SUPER SEAL FLOATING EQUIPMENT... for guiding and floating casing into the well, reducing possibility of contamination around outside of bottom joints.

- Super Seal Float Shoes and Float Collars have more than twice the sealing area of usual ball-and-seat valves... for positive shutoff against back pressure below.
- Special concrete formula in nose of shoes gives superior shock resistance and guiding efficiency.



Super Seal Float Collar

Super Seal Float Shoe

Standard Measuring Device

HALLIBURTON STANDARD MEASURING DEVICE... an essential part of your drilling or engineering equipment for:

- Running instruments to obtain bottom hole temperatures, pressures, and fluid samples.
- Running crooked hole survey instruments.
- Surveying offshore locations that require precise linear measurements.
- Accurate measurements of depths in wells.

In addition to Halliburton's Standard Measuring Device, Halliburton offers Heavy Duty, Extra Heavy Duty, and Super-Duty Devices. Whatever your needs, Halliburton has the device or combination of equipment to meet them.

CEMENTING SERVICE

251 SERVICE CENTERS — JUST MINUTES AWAY FROM YOUR RIG

CONNECTING LINK FOR INDUSTRY

- pipe with the yearmark!

Wheatland Steel pipe works for industry every hour on the hour. The "Pipe With The Year Mark" has established its reputation for precision, durability and service over a period of many years. Wheatland is conscious of the important duty performed by its product. Each length is carefully inspected and tested prior to shipment. Because Wheatland fully realizes the importance of time—service is a primary factor. Whatever your steel pipe needs—specify Wheatland, "The Pipe With The Year Mark".

WHEATLAND STEEL PIPE

API LINE PIPE IN ACCORDANCE WITH AMERICAN PETROLEUM INSTITUTE SPECIFICATIONS

WHEATLAND TUBE COMPANY

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Gain all these PLUS benefits from Automatic Metered Quantity Control

...with BRODIE *SHOCK-FREE* QUANTROLS

- Puts automation into bulk handling
- Just set it and start it
- Stops flow smoothly at preset gallonage
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- Avoids shock-damage to pumps, lines and equipment
- Adaptable to existing installations of Brodie *BiRotor* Meters
- Completely unitized replaceable assemblies
- Readily inspected or serviced
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Whether you're considering a new Brodie *Quantrol* installation — or converting existing Brodie *BiRotor* Meters to safe, automatic SHOCK-FREE Shutoff, contact your nearest Brodie Specialist today.

ON EVERY LINE FROM 2" to 8"—Capacities 100 to 1300 gpm—Working pressures to 150 psi

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BRODIE BiRotor METERS

ALL-STEEL TRUE ROTARY

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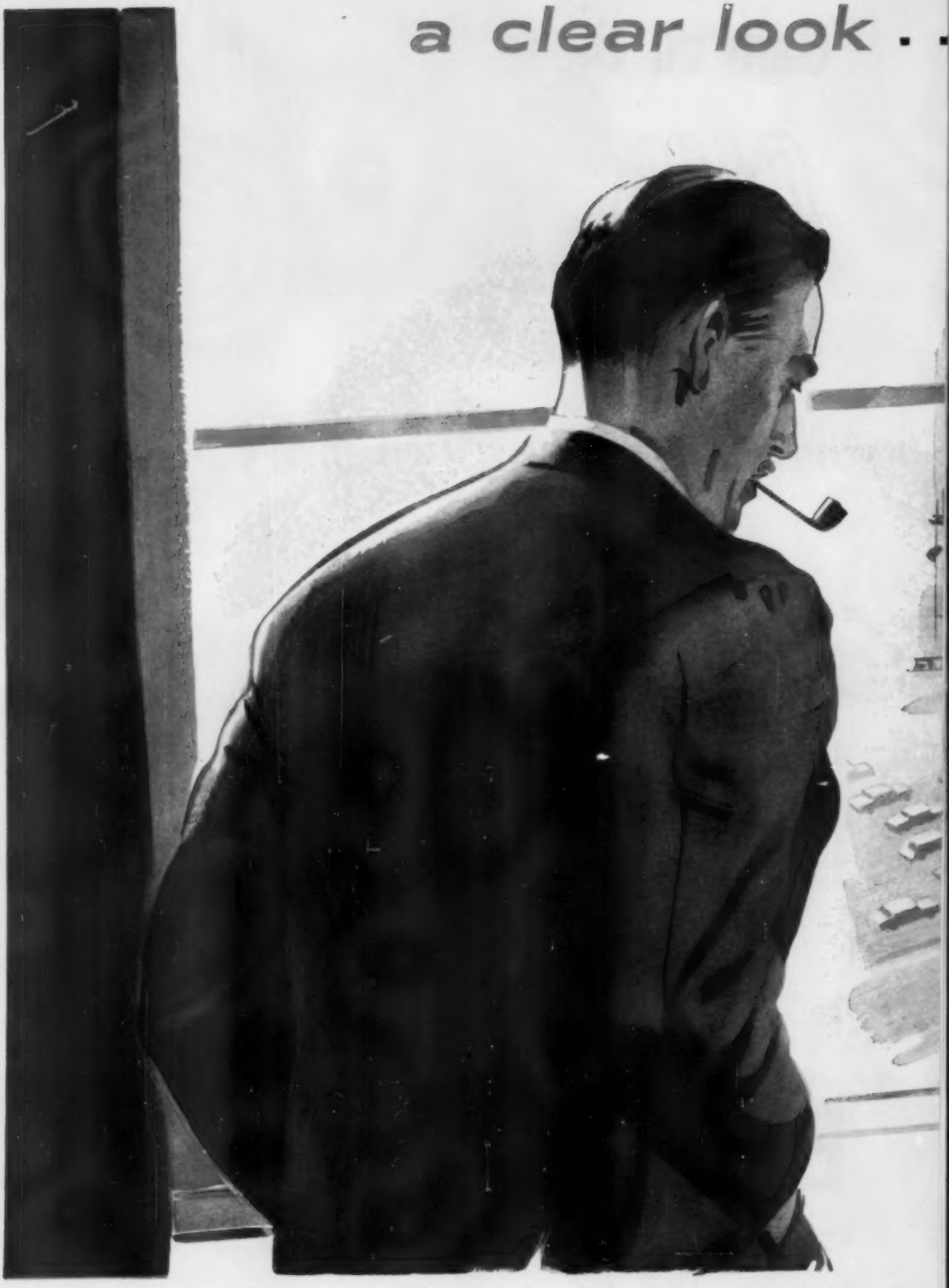
REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

a clear look . .



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Petroleum Products Marketing

For nearly a half century UOP has been developing and engineering processes for more efficient and more economic production of petroleum products and by-products. Always of primary concern, too, has been the profitable manufacture and marketing of these products by the individual refiner.

Because of this extensive experience Universal is now able to offer the industry the services of a highly qualified marketing and economic research group to help refiners, established or potential, plan intelligently for future development.

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Midwest

WELDING FITTINGS

MIDWEST Welding Fittings made of easy-to-weld JALTEN are ideal for use with the new high-tensile, high-yield pipe now being placed in oil and gas transmission service.

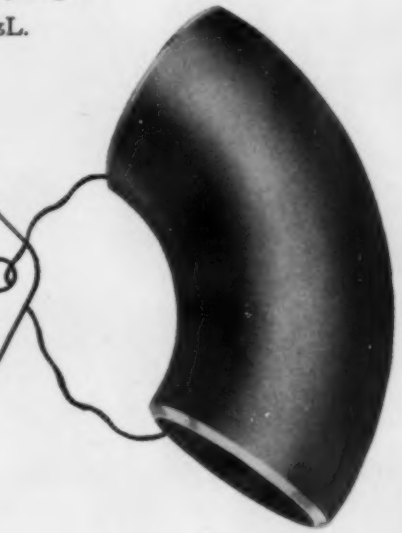
JALTEN is a new low-alloy high-strength steel made by J&L.

JALTEN PHYSICAL PROPERTIES:

	YIELD POINT P.S.I. MIN.	TENSILE STRENGTH P.S.I. MIN.	ELONGATION IN 2", % MIN.
Jalten #1	50,000	65,000	22
Jalten #2	50,000	70,000	22

CHEMISTRY	C	M	P	S	Si	Cu.	V.
Jalten #1	.15 Max.	1.30 Max.	.04 Max.	.05 Max.	.10 Max.	.30 Min.	.035/.065
Jalten #2	.15 Max.	1.40 Max.	.14 Max.	.05 Max.	.10 Max.	.30 Min.	———

Jalten #2 Equivalents: SAE 950
ASTM-A242-49T



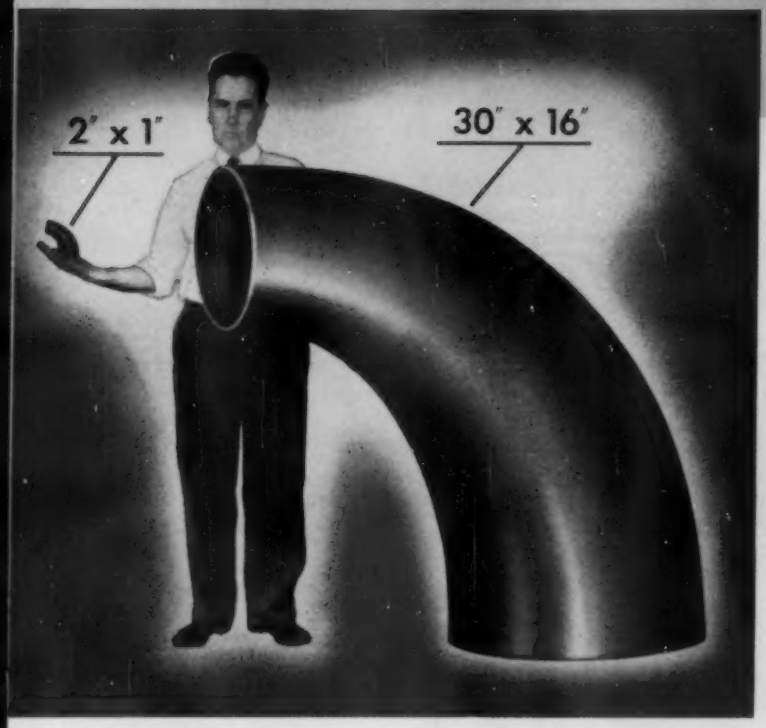
Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

NOW . . . IN STOCK . . . NOT SPECIALS

MIDWEST REDUCING ELBOWS UP TO 30″



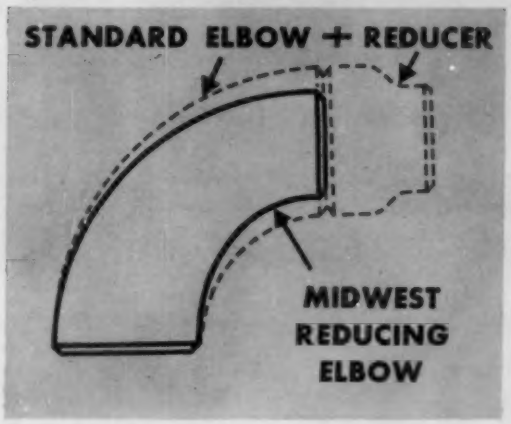
Your demand for Midwest Reducing Elbows has dictated our decision to make them STOCK items in all pipe sizes to 30″ OD and all reductions to one-half the nominal pipe size. We now have a modest stock of practically all sizes in standard and extra heavy weight, and this stock is being added to as rapidly as possible.

Midwest Reducing Elbows are also made as "specials" in heavy wall and/or any weldable alloy. The fact that our raw material is plate instead of tubing greatly increases our range of wall thicknesses and types of materials . . . it also improves the delivery.

Note the significant advantages of Midwest Reducing Elbows listed below. For further information, get in touch with the nearest Midwest Distributor or write us for Catalog 54.

✓ CHECK THESE ADVANTAGES OF MIDWEST REDUCING ELBOWS

- ✓ Save more than ⅓ of the welding required by standard elbows and reducers.
- ✓ Reduce turbulance and pressure drop because of gradual taper.
- ✓ Fit into smaller space than straight elbows and reducers.
- ✓ Greater piping design opportunities . . . easily adaptable for making special reducing fittings such as "bull-head" tees and back-outlet elbows.
- ✓ Improve appearance of piping.
- ✓ Available from stock in sizes to 30″ OD. (Heavy walls and alloys on special order.)



MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second St., St. Louis 4, Mo.

PLANTS: ST. LOUIS, CLIFTON, N. J. and LOS ANGELES

SALES OFFICES:

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CLEVELAND 14—616 ST. CLAIR AVE.
HOUSTON 2—1213 CAPITOL AVE.
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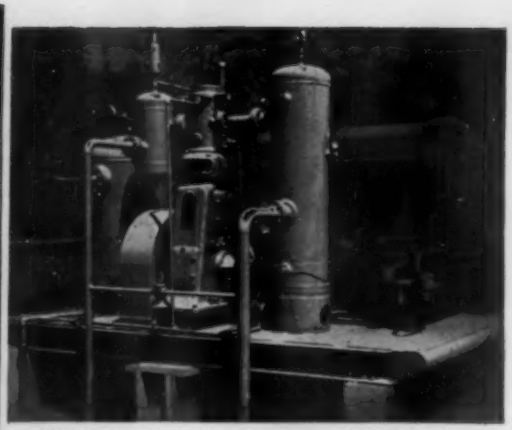
7662

THE ONLY MODERN-DESIGN COMPRESSORS FOR GAS BOOSTER OPERATION



Joy WGB-110 Gas Compressor. Inlet pressure 150 psig; Discharge pressure 500 psig. Capacity 1.028 MMCFD.

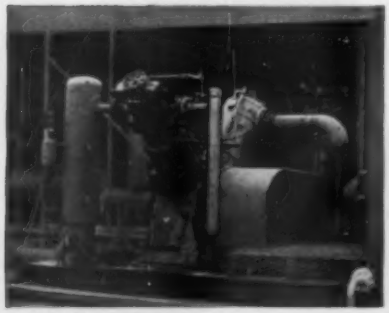
JOY *Packaged* GAS COMPRESSORS

Modern Joy Packaged Gas Compressors are backed by a century-old reputation for low maintenance and long service. These *time-proved* features make Joy Compressors the most reliable for gas gathering, repressuring, or gas lifting:

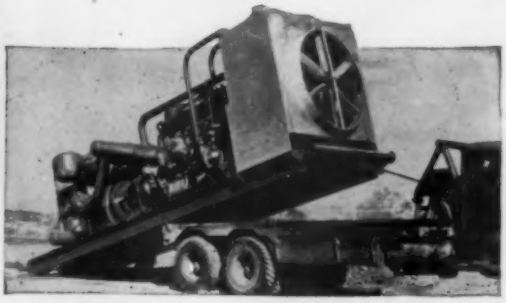
- **Field-replaceable cylinder liners.**
- **Field-replaceable crosshead guides.**
- **Patented Joy "Dual-Cushion" valves.**
- **Full force-feed lubrication.**
- **Anti-friction main bearings.**

Joy Gas Compressors are available in space-saving vertical, V-type, and semi-radial designs . . . single or two-stage units with cylinder sizes from 3" to 13½". Four different frame types accommodate a power range of 50 to 400 HP.

For the most efficient compressor for your needs, consult a Joy Engineer or write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Joy WNB-112 Gas Compressor. Inlet pressure 35 psia; Discharge pressure 665 psia. Capacity .85 MMCFD.



This photo of a Joy WNB-114 Gas Compressor Package being unloaded onto concrete pad clearly illustrates portability of unit. Inlet pressure is 5 psig; Discharge pressure is 150 psig. Capacity 2 MMCFD.

JOY ...EQUIPMENT FOR OIL FIELDS

Write for FREE Bulletin 84-31

OR

CONTACT YOUR NEAREST

JOY

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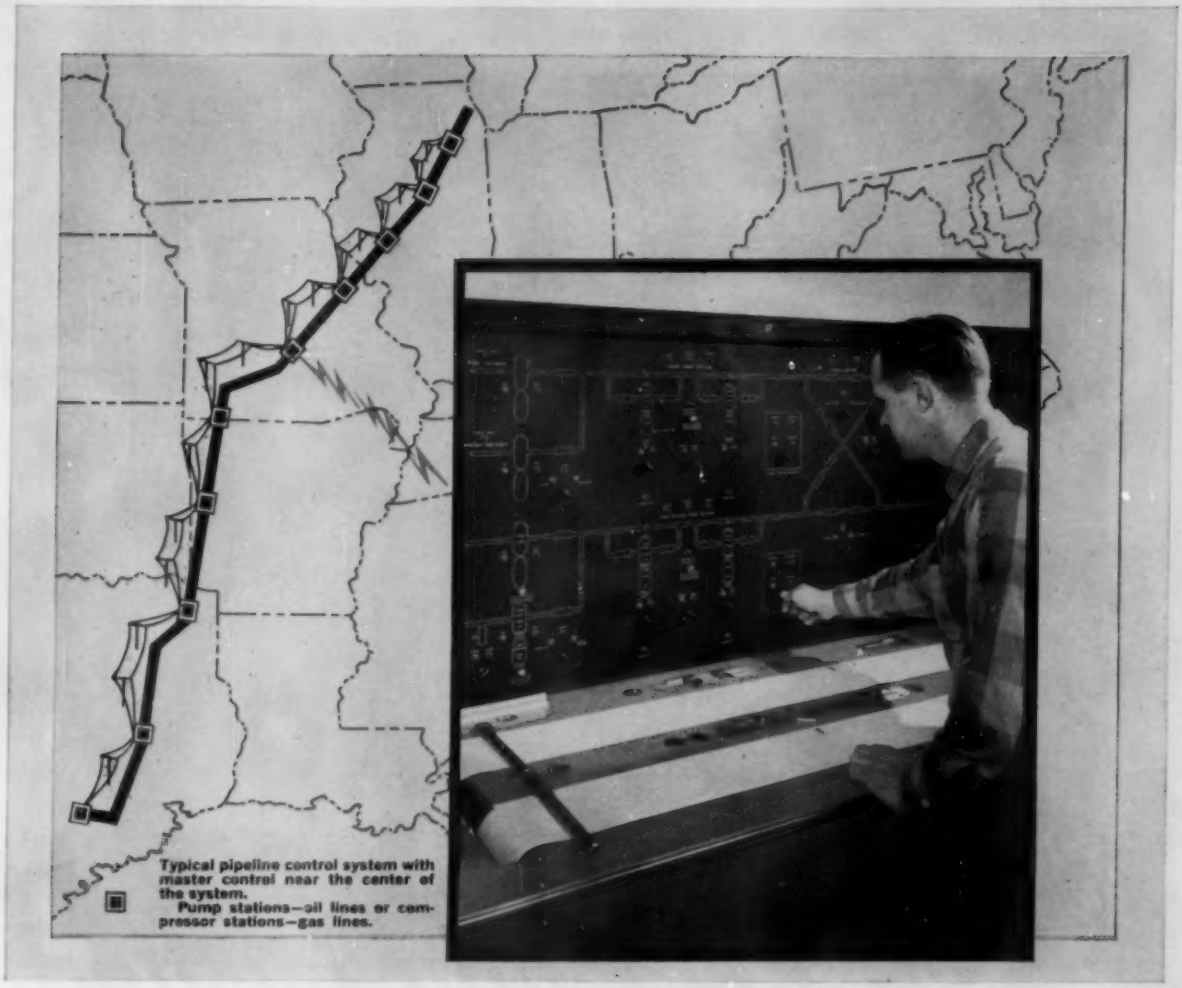
Denver 16, Colorado, C & M Industries, Inc., 200 West 48th Avenue, P.O. Box 9044

Houston, Texas, Oil & Gas Supply Company, 2525 San Jacinto Street

Tulsa, Oklahoma, McNamar Boiler & Tank Company, P.O. Box 868

WSW 08054-84


Typical pipeline control system with master control near the center of the system.
Pump stations—oil lines or compressor stations—gas lines.

UNION CTC means a complete Centralized Transport Control System

When you want a *complete* pipeline control system of any desired length, specify UNION CTC. Our engineering is based on the *systems design approach*, and Union Switch & Signal is prepared to take responsibility for integrating the entire control system. This includes communications, instrumentation, telemetering, and sequence control integrated into the one CTC system.

An operator located at a central dispatching office has all the information needed to control the flow of oil or gas throughout the system. He can function as if he were actually present at each station under his supervision. Control and indication codes can be transmitted over one pair of line wires or other channel in seconds.

UNION CTC provides more efficient dispatching and more effective control of through-put with considerable reduction in operating costs. It is *not* an expensive luxury . . . it is a profit earner.

If you are planning a new pipeline or modernizing an old one, Centralized Transport Control offers definite advantages. It can be used for gathering systems, tank farms and offshore applications. Write for our Bulletin No. 1052.

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

Quality First
. . . TO LAST

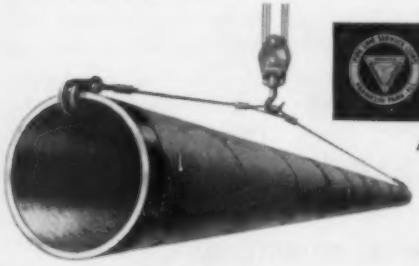
Provo, Utah • Franklin Park, Ill. • Glenwillard, Pa. • Monmouth Junction, N. J.

Longview, Texas • Corpus Christi, Texas • Harvey, La. • Sparrows Point, Md.

Pipe Protection strategically located to save you time and money!

Pipe Line Service has eight fully equipped wrapping plants to serve the major steel pipe producing areas in the country! These eight modern plants are strategically located to serve you as the pipe leaves the tube mills, en route to destination, or at a plant in your operating area. Strategic location is more than just convenience—it means substantial savings in storage and handling, lower through-freight costs, and less delivery time to jobsite.

What's more, these plant locations mean that, wherever you buy your pipe, you can get a uniform coating and wrapping job at a nearby PLS plant—no long shipping delays. If needed, you can have pipe wrapped at more than one PLS plant, delivered to the same jobsite, and be sure there is no difference in quality. Call in your nearest Pipe Line Service representative on your next coating job—he'll show you how PLS can give you the finest in pipe protection and still save you time and money.



Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

There's a PLS plant strategically located to serve YOU!

Photo of nitric acid plant courtesy of Allied Chemical and Dye Corp., Nitrogen Div. Daily capacity in excess of 250 tons.

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THE CHEMICAL AND INDUSTRIAL CORP.

CINCINNATI 26, OHIO

Designers and Builders of Plants for the Processing of Ammonia Available Throughout the World

NITRIC ACID • PHOSPHORIC ACID • SULPHURIC ACID • AMMONIUM NITRATE • AMMONIUM PHOSPHATE • COMPLEX FERTILIZER

WAGNER TRANSFORMERS . . . THE CHOICE OF LEADERS IN INDUSTRY

Wagner Sealed Dry-Type Transformers can serve under the most adverse conditions

Impervious to DUST, LINT, HUMIDITY, HIGH AMBIENT TEMPERATURES, FLOODING—no need for vaults or barriers

Here's a unit substation transformer that you can safely install in any load center—any place—no matter how tough the operating condition.

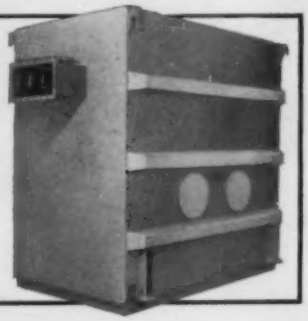
Wagner Sealed Dry-Type Transformers are hermetically sealed in a welded steel case to provide positive protection from contamination, fire and explosion hazards.

Class H insulation is used throughout the transformer. Core and coils are impregnated with silicone varnish and are sealed in the case which contains inert-dry-nitrogen under pressure to prolong insulation life. Maintenance is reduced to periodic checking of bushings case and gas pressure.

Available in ratings from 300 to 2000 kva, 5 or 15 KV high voltage, 480 volts low voltage. For complete information on these sealed dry-type transformers, write for Bulletin TU-214 or call the Wagner branch office near you.

PREDESIGNED
to save you money

Wagner Nitrogen-Filled Dry-Type Transformers save you individual job engineering time and cost. That's because they are PRE-DESIGNED in standard ratings coordinated with the specifications of unit substation switchgear builders. These standard designs assure quicker delivery of the correct transformer for your load center installation.



Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

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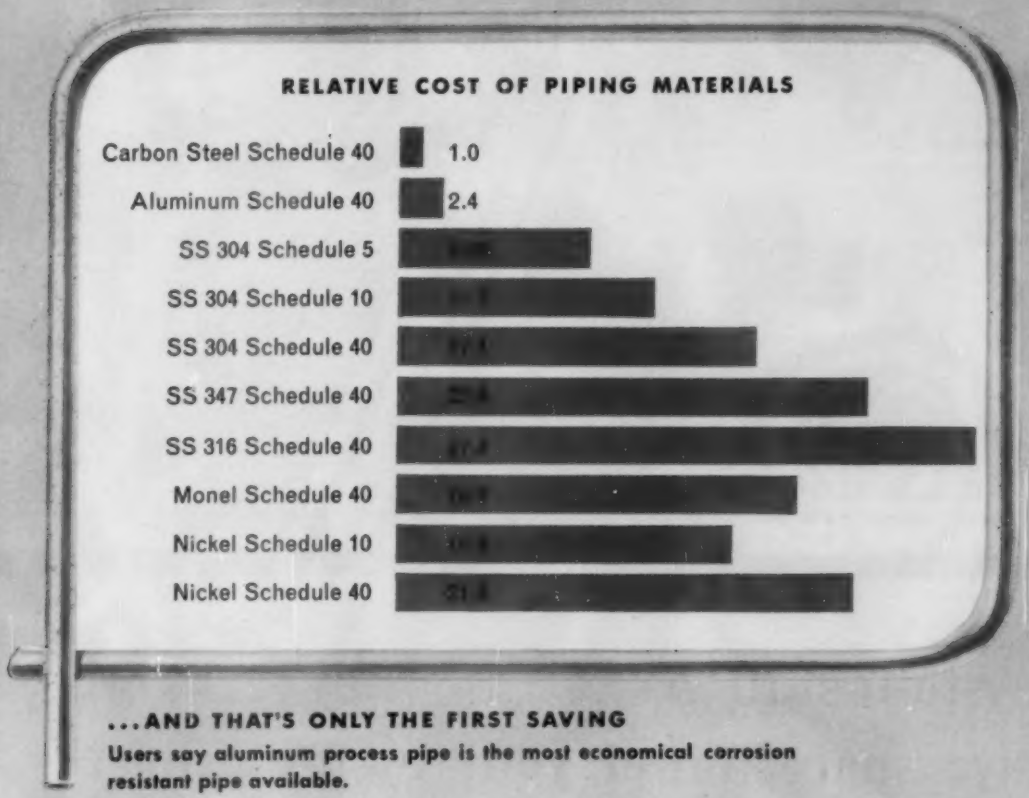
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Here's the cost story on Reynolds Aluminum process pipe



...AND THAT'S ONLY THE FIRST SAVING

Users say aluminum process pipe is the most economical corrosion resistant pipe available.

THESE ARE THE REASONS:

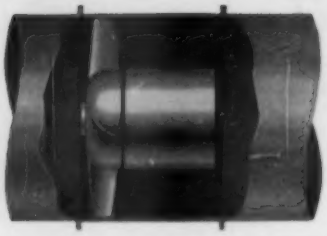
- Aluminum costs less to buy.
- Aluminum costs less to install because of light weight and weldability.
- Aluminum resists corrosive effect of hydrogen peroxide, nitrogen solutions, many acids, alcohols, foods, sweet and sour crudes, raw or refined gases, kerosene, gasoline, napthas, and many other process liquids.
- Aluminum is non-sparking for greater safety to plant and personnel.
- Aluminum requires little maintenance—has longer life.

Write for this important literature: "Corrosion Keys for Aluminum" and "Aluminum Process Pipe".

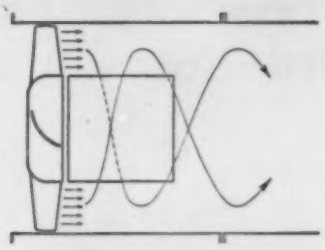
For more information on how you can save with Reynolds Aluminum Process Pipe, call the Reynolds office listed under "Aluminum" in classified telephone directories, or write *Reynolds Metals Company, P.O. Box 1800-CR, Louisville 1, Kentucky.*
International Division, 19 East 47th Street, New York, 17, N.Y.

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

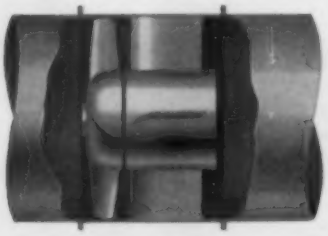
See "CIRCUS BOY", Reynolds exciting dramatic series, Sundays, NBC-TV



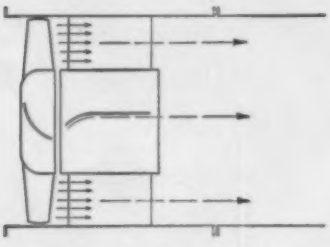
The tubeaxial fan . . . a wide range of volumes at medium pressures, with uniform velocity . . .



. . . at moderate pressures the spiral air discharge straightens out a short distance from fan blades.



The vaneaxial fan . . . stationary guide vanes reduce turbulence and increase fan efficiency . . .



. . . resulting straight-line air flow leaving fan assures smooth, quiet operation for all conditions.

Easy-to-install American Blower axial fans save space, lower your installation cost

Versatile American Blower axial fans can be mounted vertically or horizontally. When ducts are properly reinforced, the fan can be supported directly by the duct connection.

American Blower axial fans provide straight-line air flow, eliminating elbows, bends, and transformation pieces—can be installed vertically or horizontally in ducts, with minimum foundations and supports . . . with savings in space, first cost, handling, and installation.

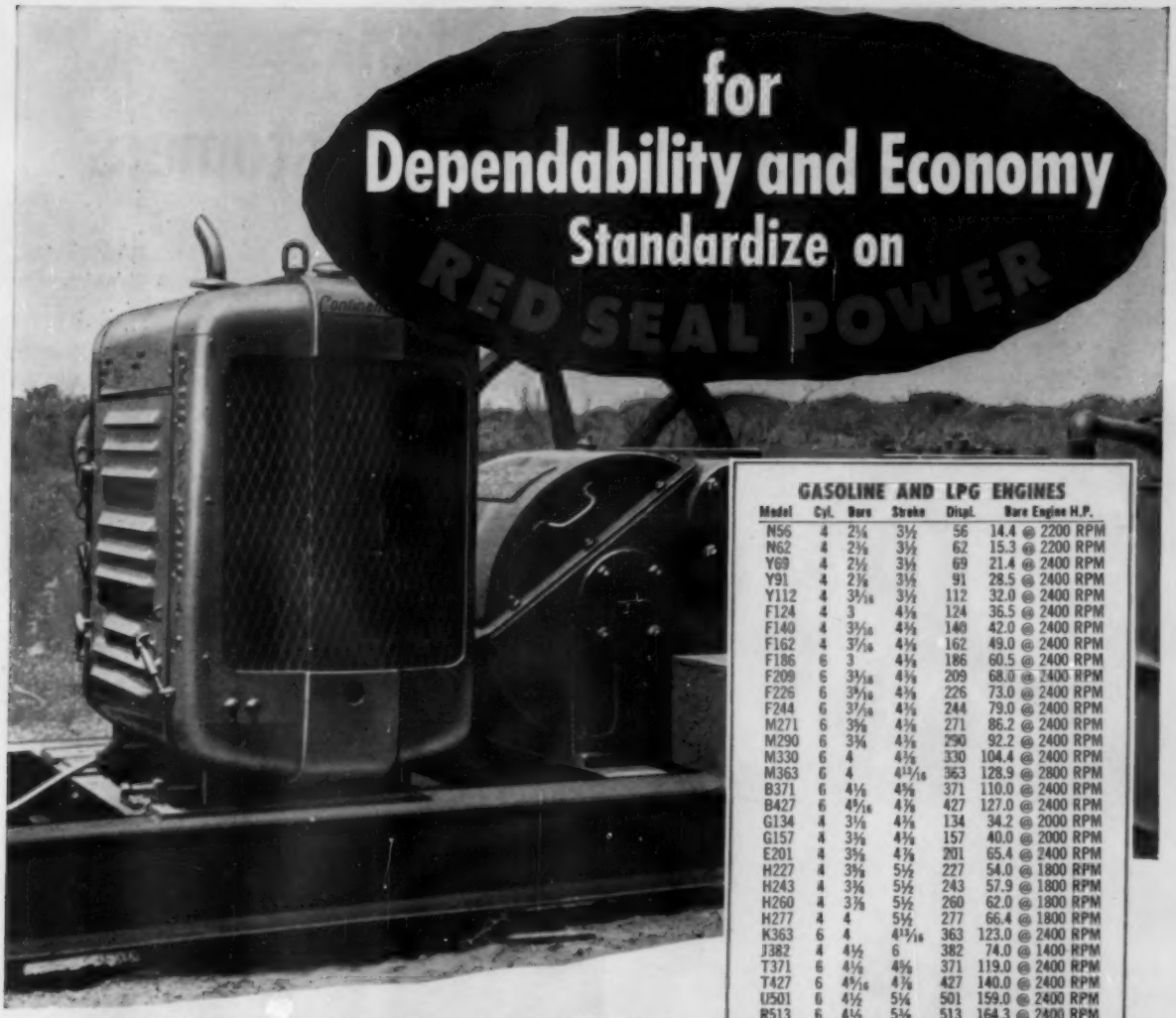
These compact, self-contained axial fans are available in three general designs—vaneaxial for direct and V-belt drive, spray-booth vaneaxial for V-belt drive, tubeaxial for direct drive. A complete line of accessories is offered to adapt this versatile line of fans to your particular requirements. Capacities range from 2,500 cfm to 75,000 cfm. Larger sizes are available on special order.

For more information on axial fans, or on other equipment from American Blower's complete air-handling and -conditioning line, call our nearest branch office, or write direct to American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

Division of AMERICAN-Standard

for Dependability and Economy Standardize on RED SEAL POWER



A product of more than 55 years' specialized experience, Continental Red Seal oil field power embodies an array of quality features—many of them exclusive—that make for dependability, economy and long trouble-free life. The Red Seal Model F-162 shown above, operating in Stonewall County, Texas, replaced another Red Seal which had been in pumping service continuously for eight years. . . . Red Seals are engineered for every oil field application. They are available at closely-spaced power levels, for use on all standard fuels. Ask your oil field supply store or get in touch with your nearest Continental office.

• • •

GASOLINE AND LPG ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N56	4	2¼	3½	56	14.4 @ 2200 RPM
N62	4	2⅜	3½	62	15.3 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3 5/16	3½	112	32.0 @ 2400 RPM
F124	4	3	4⅛	124	36.5 @ 2400 RPM
F140	4	3 1/16	4⅛	140	42.0 @ 2400 RPM
F162	4	3 7/16	4⅛	162	49.0 @ 2400 RPM
F186	6	3	4⅛	186	60.5 @ 2400 RPM
F209	6	3 1/16	4⅛	209	68.0 @ 2400 RPM
F226	6	3 3/16	4⅛	226	73.0 @ 2400 RPM
F244	6	3 7/16	4⅛	244	79.0 @ 2400 RPM
M271	6	3⅜	4½	271	86.2 @ 2400 RPM
M290	6	3¼	4½	290	92.2 @ 2400 RPM
M330	6	4	4½	330	104.4 @ 2400 RPM
M363	6	4	4 13/16	363	128.9 @ 2800 RPM
B371	6	4½	4⅜	371	110.0 @ 2400 RPM
B427	6	4 5/16	4⅜	427	127.0 @ 2400 RPM
G134	4	3½	4½	134	34.2 @ 2000 RPM
G157	4	3⅝	4½	157	40.0 @ 2000 RPM
E201	4	3⅝	4⅞	201	65.4 @ 2400 RPM
H227	4	3⅝	5½	227	54.0 @ 1800 RPM
H243	4	3⅜	5½	243	57.9 @ 1800 RPM
H260	4	3⅞	5½	260	62.0 @ 1800 RPM
H277	4	4	5½	277	66.4 @ 1800 RPM
K363	6	4	4 13/16	363	123.0 @ 2400 RPM
J382	4	4½	6	382	74.0 @ 1400 RPM
T371	6	4⅛	4⅝	371	119.0 @ 2400 RPM
T427	6	4 5/16	4⅞	427	140.0 @ 2400 RPM
U501	6	4½	5¼	501	159.0 @ 2400 RPM
R513	6	4½	5⅛	513	164.3 @ 2400 RPM
R572	6	4¼	5½	572	182.4 @ 2400 RPM
R602	6	4⅞	5⅛	602	191.7 @ 2400 RPM
V603	8	4¼	4¼	603	220.0 @ 2800 RPM
S749	6	5⅛	5½	749	217.0 @ 2200 RPM
S820	6	5¼	5½	820	237.0 @ 2200 RPM

CUSHIONED POWER DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
ZD129	4	3¼	3⅜	129	34.0 @ 2000 RPM
GD157	4	3½	4½	157	39.0 @ 2000 RPM
*ED201	4	3½	4⅜	201	45.8 @ 2000 RPM
HD243	4	3¾	5½	243	55.0 @ 2000 RPM
*HD260	4	3⅞	5½	260	59.0 @ 2000 RPM
*HD277	4	4	5½	277	63.2 @ 2200 RPM
*JD382	4	4½	6	382	72.5 @ 1600 RPM
TD427	6	4 5/16	4⅜	427	106.0 @ 2000 RPM
RD572	6	4¼	5⅛	572	154.0 @ 2000 RPM
VD603	8	4¼	4¼	603	175.0 @ 2600 RPM
SD802	6	5 5/16	5½	802	202.0 @ 1800 RPM

*Available for industrial applications only.

SERVICE FACILITIES AND GENUINE RED SEAL PARTS AVAILABLE EVERYWHERE

CONTINENTAL MOTORS ® Powerful as the Nation AMERICA'S STANDARD

Continental Motors Corporation

MUSKEGON, MICHIGAN

WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKEGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

How neoprene tanks slash costs for Dowell customers

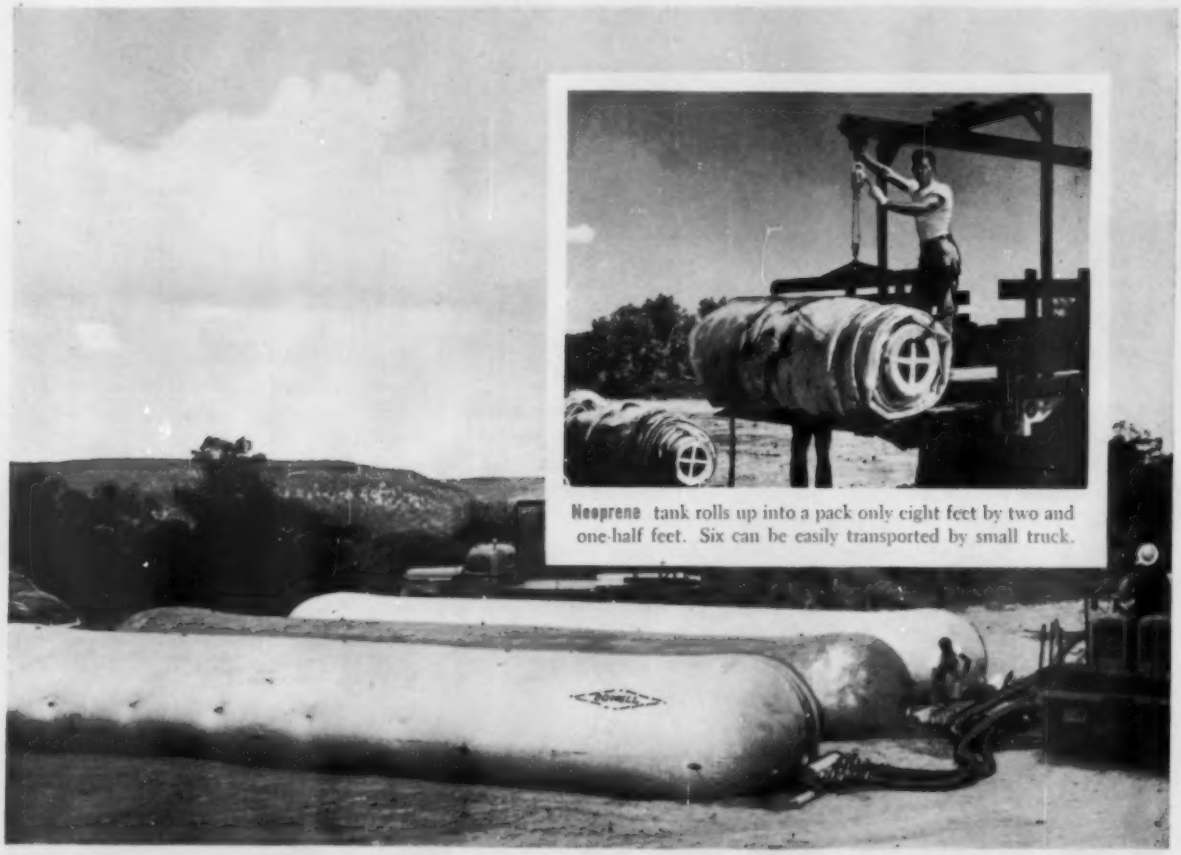
In the rugged San Juan Basin, Dowell, Incorporated, offers its customers collapsible storage tanks* made of nylon fabric, coated inside and out with Du Pont neoprene. By using these synthetic rubber tanks instead of steel tanks on well stimulation treatments, Dowell's customers are cutting transportation, handling and maintenance costs and saving vital time.

Each 15,000-gallon tank rolls up like a sleeping bag. Six can be carried on a small truck, for they weigh only 1350 pounds including fittings. When filled with water, crude or refined oils, they are 47 feet long, 10 feet 8 inches wide and 5 feet 3 inches high. The use of neoprene in these tanks is highly desirable because the rubber lining must resist oil and the cover must resist deterioration by sunlight, abrasion and rough handling.

Oil men around the world have found hundreds of uses for neoprene because of its unique combination of properties. It resists deterioration under the most adverse conditions because it withstands oil and corrosive chemicals, sunlight, heat, cold and aging.

Why not let neoprene save money for you? Next time you're buying piston rubbers, pipe wipers, rotary drilling hose or gaskets, specify NEOPRENE.

*PATENT PENDING



Neoprene tank rolls up into a pack only eight feet by two and one-half feet. Six can be easily transported by small truck.

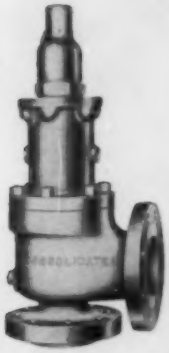
NEOPRENE

MADE BY DU PONT FOR 25 YEARS

DU PONT

BETTER THINGS FOR BETTER LIVING
...through chemistry

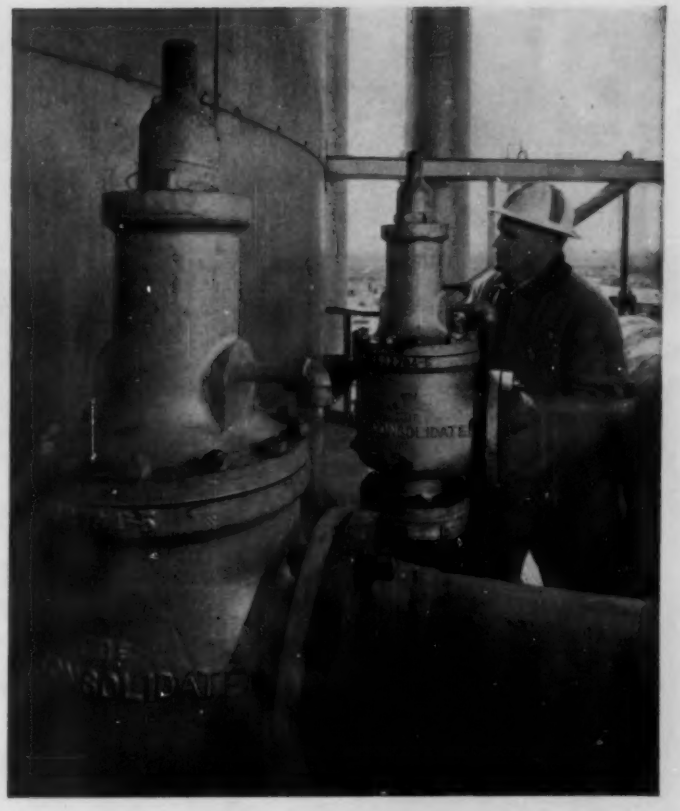
WHAT YOU DON'T SEE MEANS THE MOST



...in service

...in economy

...in protection



Few Functional Parts. Each part is precision machined and aligned to assure long valve life and minimum maintenance.

Economical "2 in 1" Design. Construction that permits you to convert the Standard valve to the Bellows type *in your own shop.*

Only One Adjusting Ring. Easy to set *before* the valve is installed to obtain peak performance at 4-5% blowdown. Whatever the ring position, *full relieving capacity is certain* because a fixed maximum secondary orifice provides full lift at 10% over-pressure. Even with "superimposed" back pressure in the relieving system, *valve action is consistently positive.*

Temperature-Compensating Disc. Temperature-induced stresses cannot distort the seat. Seating is always tight, even when nominal strains of unanchored discharge piping are present. Minimum guiding area is provided to align the seating surfaces – less chance of a sticking disc holder when corrosion or contamination build up on the guiding surfaces. The seating surfaces are optically-ground flat – servicing is easier, highly economical.

Huddling Chamber and Secondary Orifice Contours take full advantage of the stream pressure and kinetic forces – an exclusive safety feature.

Low-Placed Threaded Section Holds Nozzle in Valve. Assures high resistance to discharge of piping strains. No leakage from strain induced into the nozzle.

Standardized Inlet-Outlet Face-To-Face Dimensions permit easy interchangeability with the valves of some other manufacturers.

Certified and Approved. Both Standard and Bellows Valves – in the full range of sizes and pressures – are approved under ASME Unfired Pressure Vessel Codes and are certified by the National Board of Boiler and Pressure Vessel Inspectors.

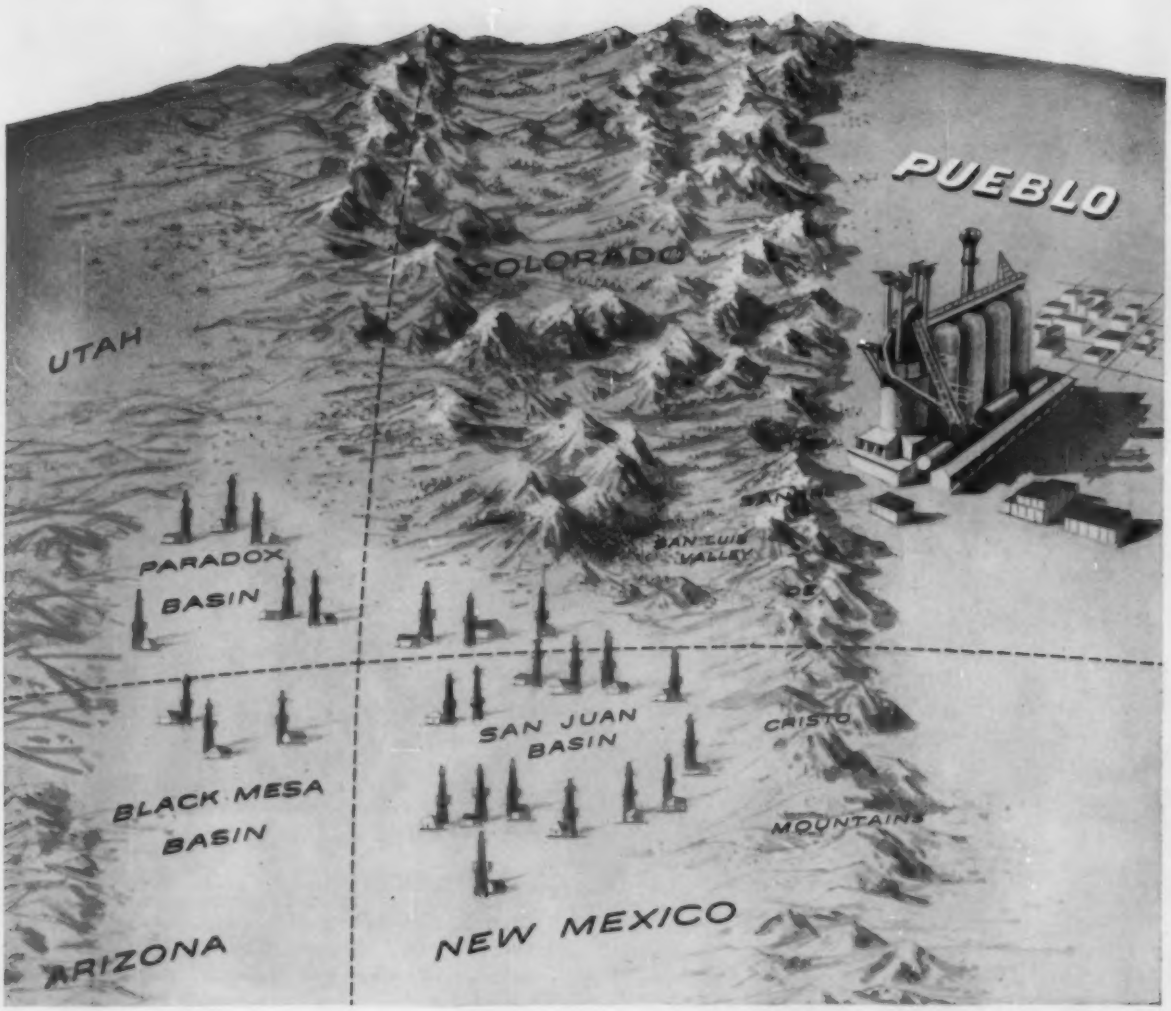
Absolute protection for personnel and facilities . . . far fewer inventory and maintenance needs . . . long-term economy. Be assured on every count before you buy another safety relief valve. Investigate fully the quality of Consolidated Safety Relief Valves—then compare. *Write for Catalog 1900.*

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario.*

CONSOLIDATED SAFETY RELIEF VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** TULSA, OKLAHOMA

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Okla.* AIRCRAFT CONTROL PRODUCTS, *Danbury, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*



you'll see

CF&I SEAMLESS CASING AND TUBING

throughout the four corners area

Take the San Juan Basin . . . or the Paradox Basin . . . or the Black Mesa Basin . . . or any other active part of the Four Corners Area. There you'll find CF&I Seamless Oil Country Casing and Tubing. For operators all over this important producing and exploration area have found that CF&I's conveniently located Seamless Tube Mill offers them top-quality casing and tubing.

CF&I Seamless Oil Country Casing and Tubing is available in 2⅜" through 9⅝" O.D. It meets or exceeds API STD 5A specification.

4433

SEAMLESS TUBULAR PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION
Denver, Colorado

CF&I

DOCTOR OF SHIPS

Rick Bruhn specializes in preventive "medicine."

Rick is the Mobil marine engineer in Hong Kong. His counterparts work in every major Free World port—more than 400.

As you trust the skill, training and experience of your doctor, so do the men who know marine machinery trust the Rick Bruhns to diagnose their ships' needs and prescribe the right fuels and lubricants.

Mobil know-how created the first and most comprehensive service of this kind. It helps make sure that goods you send or receive move without delay—that as a passenger you arrive and depart on schedule—that every voyage is a Bon Voyage.

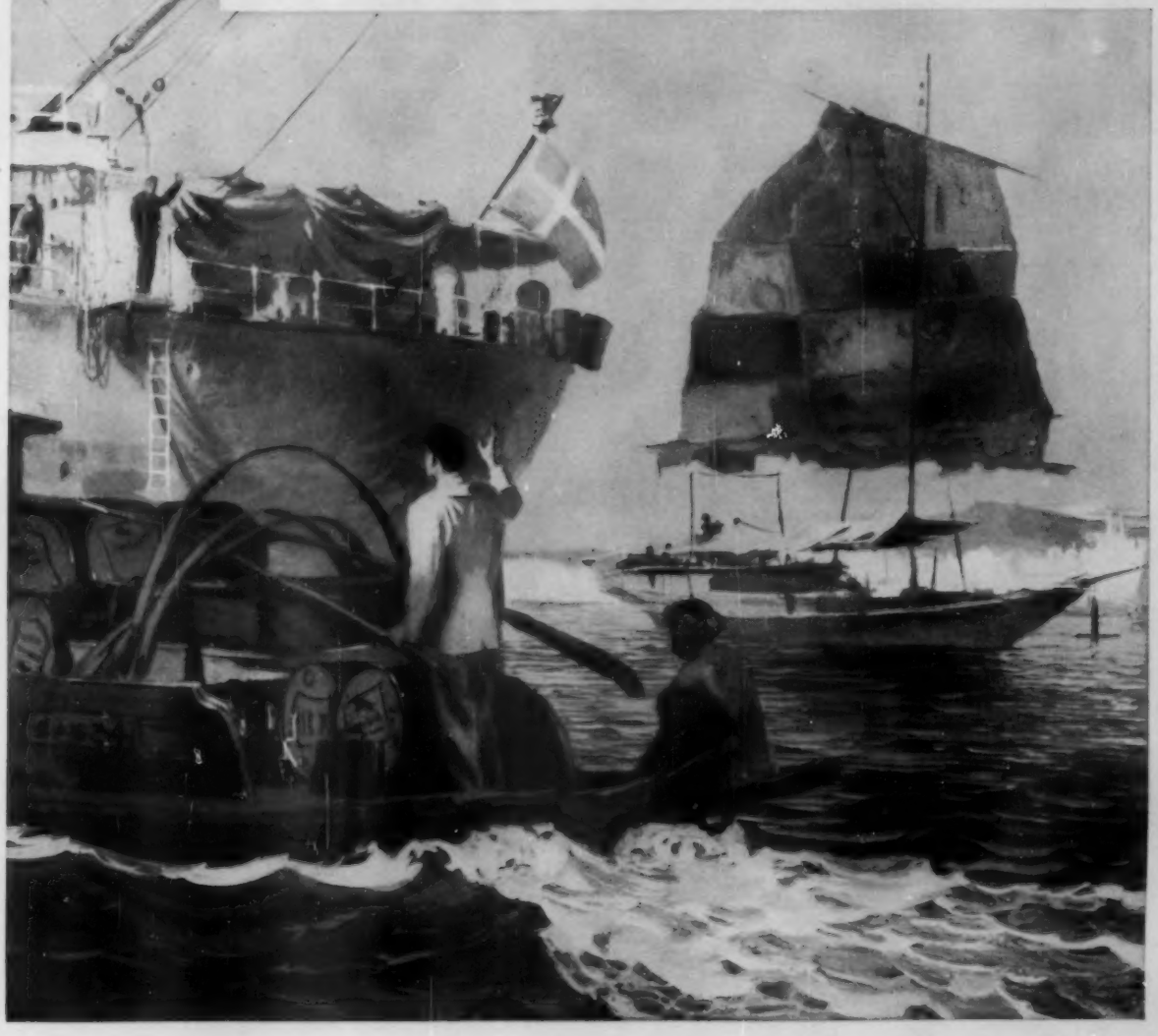
This is the master's touch in oil—servicing the world's mightiest warship, the world's fastest boat, every flagship of every leading ship line, two-fifths of all the world's freighters as well as the first atomic-powered submarine.

SOCONY MOBIL OIL COMPANY, INC.

and Affiliates: Magnolia Petroleum Co., General Petroleum Corp.

Leader in lubrication for 91 years

Mobil



"After 150,000 feet, these U. S. Rainbow V-Belts were good as new!"

says "Red" Royal

"At Oil Production Maintenance Company's rig N-75," says "Red", "toolpusher Lefty Wood swears by U. S. Rainbow® V-Belts. The belts (U.S. Rainbow D540) worked steadily on a Wilson-Snyder pump for 2 years, and just wouldn't wear out or go haywire."

"Red" doesn't want any other kind of belts. That makes sense, because these U.S. Rainbow V-belts had already drilled 150,000 feet at a belt cost of less than a cent a foot.

"Red" can name many a cost-conscious driller who insists on U.S. Rainbow to help him drill *more* hole in the *same* number of days. In every oil field U.S. Rainbow V-Belts are hard at work, taking rough shock treatment on location after location, never letting anyone down.

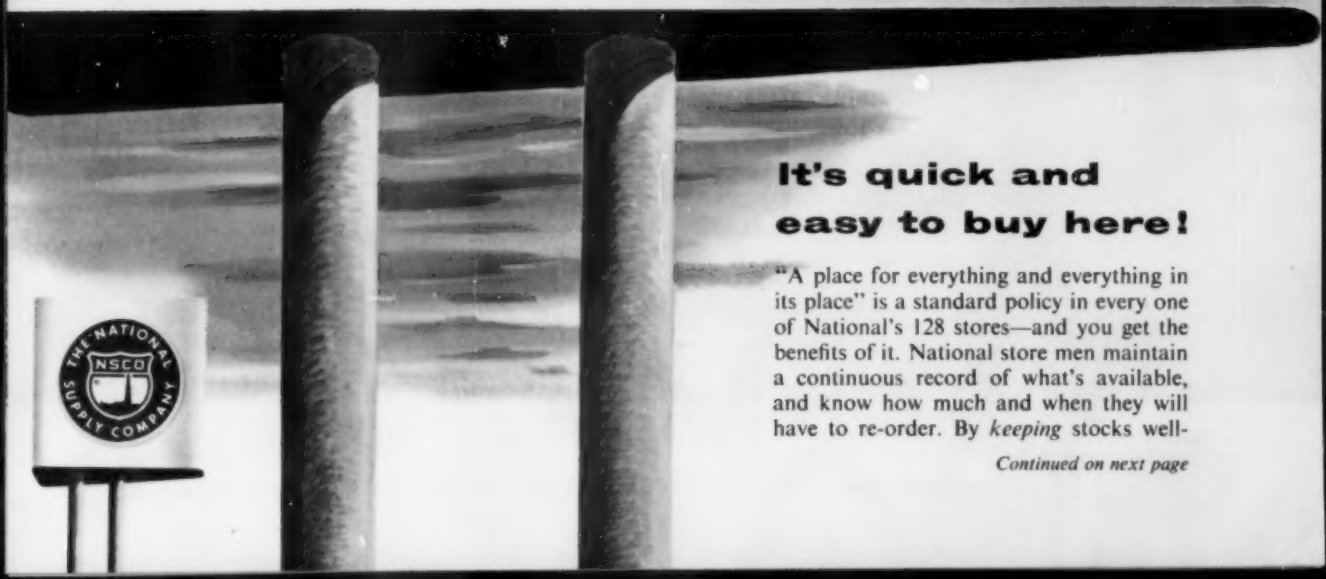
This same rig also uses another record-breaking "U.S." product—U.S. Royal 4 Rotary Hose, as well as U.S. Suction Hose and U.S. Vibrator Hose. Rely on "U.S." to give you *quality* and help you in the battle against downtime.

Developed by Science . . . Proved by Drillers

US RUBBER

Mechanical Goods Division

United States Rubber



It's quick and easy to buy here!

"A place for everything and everything in its place" is a standard policy in every one of National's 128 stores—and you get the benefits of it. National store men maintain a continuous record of what's available, and know how much and when they will have to re-order. By *keeping* stocks well-

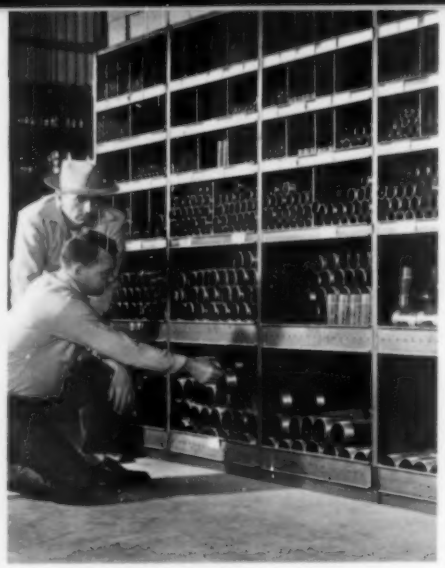
Continued on next page

Continued from previous page

organized for fast order filling, every National Store provides the buying convenience you need to meet busy work schedules.

Careful stock maintenance, however, is just one of the many buying advantages at National Supply. Here are more benefits you can always rely on: every store inventory is tailored to the needs of the area it serves, and every item in that inventory is a quality, proved-in-service product. Furthermore, all the operating and maintenance instructions you may need are available in helpful, well-illustrated manuals. Complete information on new products is also readily available in printed bulletins.

In effect, you have all the conveniences of a modern supermarket at a National Supply Store. Stop in soon—you'll like the friendly service, too.



More than 3,000 products are stocked in the average National Supply Store. We keep them arranged for your quick and easy selection.

15 reasons why National Triplex Pumps reduce downtime!

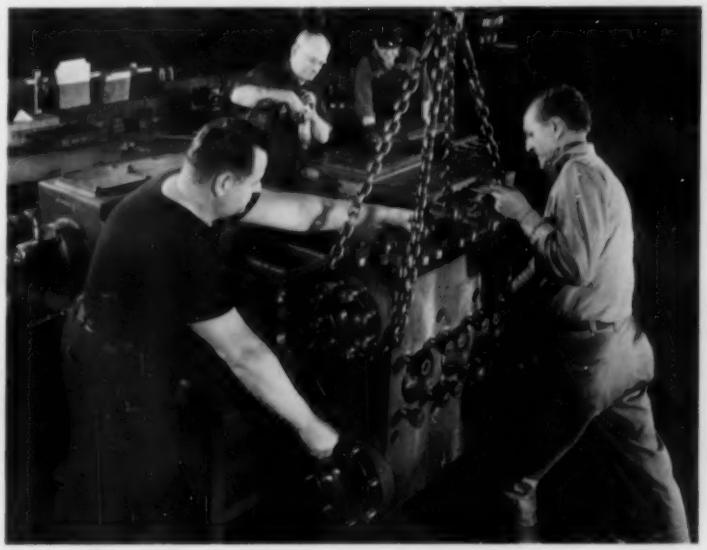
These sound construction features are the reasons why National Triplex Pumps perform at low cost on a host of pumping jobs:

1. Connecting rods equipped with steel backed babbitt lined precision bearing shells.
2. Fluid ends of special alloy for maximum corrosion resistance or non-corrosive service are available for both high and low pressure.
3. Close end clearances in the fluid end plunger cavity, promoting best filling, improving volumetric efficiency and reducing shock and vibration on pump and manifolding.
4. Removable stuffing box cartridges* and plungers make conversion from one size to another possible through use of plunger kits at minimum cost.
5. All packing easily reached for adjustment.
6. A variety of plungers are available for either corrosive or non-corrosive service. All are ground to the finest finish to give the longest plunger and packing life.
7. Stainless steel disc-type valves, giving maximum corrosion resistance and having light moving parts, thus reducing inertia and allowing maximum fluid filling.
8. Suction valves removable through cylinder heads, which allows installation of valves in a single valve pot without complications of valve spacing devices, and maintains interchangeability of all valves. Makes possible straight through fluid flow with minimum end clearance.
9. Low suction elements, assuring better suction conditions than with a vertical pump.
10. Coordinated design of suction passages, valve areas and end clearances, improving fluid filling and permitting higher speed operations.
11. Lubrication of all power end parts is accomplished by a directed splash system. Deflectors positioned in the power frame direct the splash to built-in reservoirs which in turn deliver oil to the moving parts. (On the F-90, a pressure lubrication system, as well as splash lubrication, is standard.)
12. Horizontal design gives larger support area as well as lower center of gravity, thereby reducing vibration.
13. Reversible crankshaft assembly permits direct connected engine drive.
14. Suction and discharge connections arranged for piping from either side of pump.
15. Skids optional for unitized portable mounting.

*Patent Pending

Reduce pumping downtime now with better-built National Triplex Pumps! You can get complete information and fast delivery through the National Supply representative in your area.

These National F-60 and F-90 triplex pumps are in use on a pressure maintenance project in Louisiana. They're equally effective in many other types of applications, including salt water disposal, pilot waterflooding, formation fracturing, and as power-oil sources for subsurface hydraulic pumps.



In National Supply's Toledo, Ohio plant, skilled personnel assemble the fluid end of a triplex pump. The four Triplex pumps (F-15, F-30, F-60 and F-90) in the National Line have a rated input hp range of 16.7 to 100 hp, with fluid ends available for high or low pressure, corrosive or non-corrosive service.

THE NATIONAL SUPPLY COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

More quality production equipment on the next page!

This installation in Alabama is a typical example of National Pumping Units and wellhead equipment in use on dual completion wells.

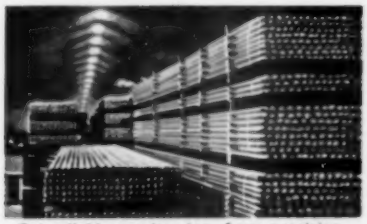
You get low-cost production with National Pumpers, too!

Having trouble with load reversals? National Pumping Units have an extra margin of strength that meets this problem. They have exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handle shock loads from load reversals.

There are other important National Pumping Unit features that insure dependable operation:

- Easy-to-install, strong main base.
- Exceptionally stable, well-balanced samson post.
- Pitman assembly features easy maintenance, fast assembly.
- Rugged walking beam and beam hanger for extra years of service.

Get the facts on National Pumpers today. For the full story on the high performance and low operating costs they offer, see the National Supply Store men or representatives in your area soon. New bulletins giving the complete story on these quality pumping units are available.



Get reliable service, too, from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in a range of grades for every condition.

For certain types of wells, the National Plunger Lift can be the best production method. It uses either formation gas or injected gas for operation. See your National representative for details.

Interchangeable units provide many combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two major features of this National Wellhead Equipment.

THE NATIONAL SUPPLY COMPANY

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DIVISION OFFICES: Denver; Fort Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

the most ECONOMICAL maintenance is PREVENTIVE maintenance

TWO OF THE MOST EFFECTIVE PREVENTIVE MAINTENANCE MEASURES ARE:

1 *98% to 100% SALT REMOVAL with Tretolite Chemical Desalting*

Tretolite Desalting prevents salts, solids, trace metals and other impurities from entering the refinery stream. It prevents salt plugging and fouling in condensers, exchangers and towers, reducing clean-outs and tube rattling to minimum. Tretolite Desalting is an automatic, all-chemical process that consistently delivers salt removals in the 98% to 100% range.

2 *EFFICIENT CORROSION PREVENTION with Kontol Corrosion Inhibitors*

Kontol Corrosion Inhibitors prevent internal corrosion and hydrogen blistering and help to eliminate scale and fouling difficulties. Kontols are readily adsorbed from hydrocarbon solutions at metal surfaces to form a tough impervious film. In addition to their inhibiting properties, the Kontols are powerful detergents which clean and de-foul refinery equipment.

Ask the man in the red car

The Tretolite Service Engineer is always on call to assist you in your maintenance and processing problems.

AR-57-1

TRETOLITE COMPANY

A Division of Petrolite Corporation

369 MARSHALL AVENUE, ST. LOUIS 19, MISSOURI

5515 TELEGRAPH ROAD, LOS ANGELES 22, CALIFORNIA

Chemicals and Services for the Petroleum Industry

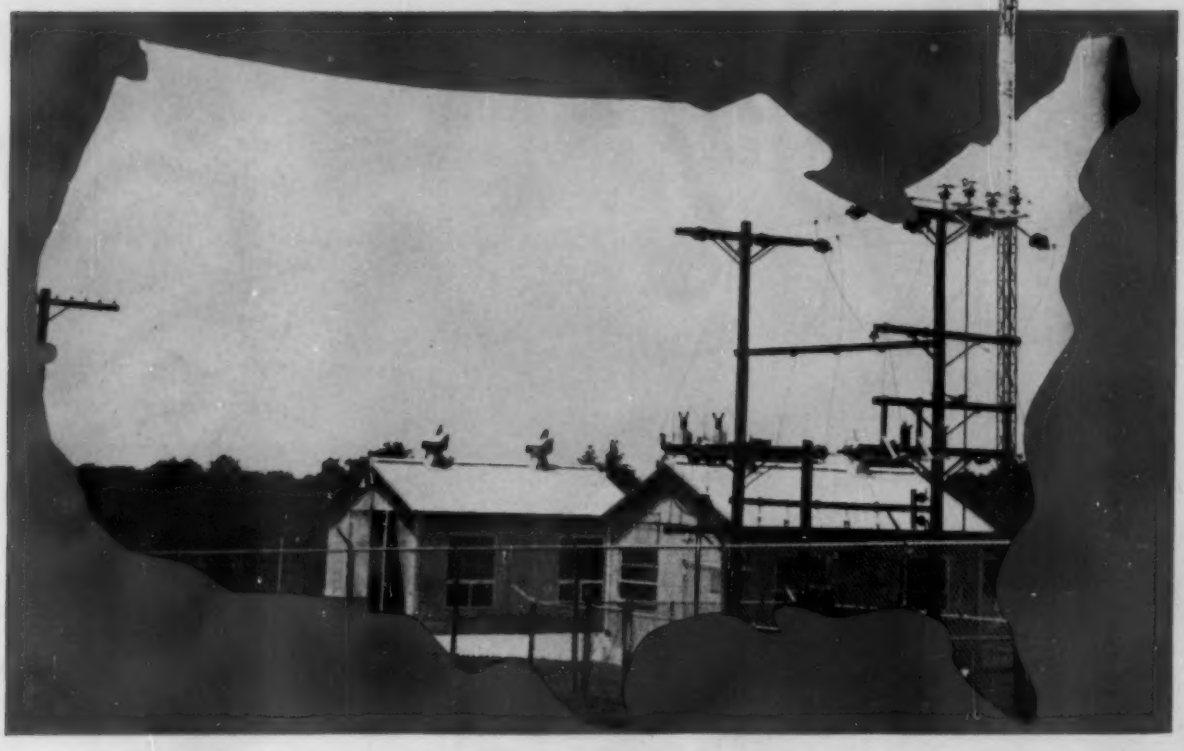
DESALTING • DEMULSIFYING • CORROSION INHIBITING • SCALE PREVENTING

FUEL OIL ADDITIVES • WATER DE-OILING • METAL DEACTIVATORS

"SOLD BUT NOT FORGOTTEN" MIGHT WELL BE STAMPED ON EVERY ARMSTRONG TRAP YOU BUY... BECAUSE YOU CAN ALWAYS GET PROMPT, COMPETENT SERVICE FROM THE LOCAL ARMSTRONG REPRESENTATIVE OR THE FACTORY. PARTS WILL ALWAYS BE AVAILABLE, NO MATTER HOW OLD THE TRAP... MANY ARE STILL IN 24-HOUR SERVICE AFTER 20 YEARS. FROM INSTALLATION PRACTICE TO PREVENTIVE MAINTENANCE YOU CAN COUNT ON THE ARMSTRONG PEOPLE FOR HELPFUL ASSISTANCE. DO YOU HAVE "THE ARMSTRONG STEAM TRAP BOOK" COVERING SELECTION, INSTALLATION, MAINTENANCE, CAPACITIES AND PRICES? COPIES ARE AVAILABLE WITHOUT OBLIGATION. WRITE ARMSTRONG MACHINE WORKS, 8689 MAPLE STREET, THREE RIVERS MICHIGAN.

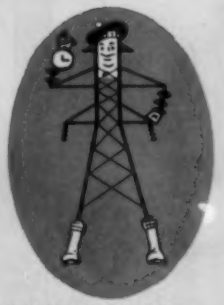
ARMSTRONG STEAM TRAP

ELECTRIC POWERED MICROWAVE CONTROLLED PIPELINE STATIONS NOW SPAN AMERICA...



One of many ways progressive management puts UTILITY ELECTRIC POWER to work

If you are in the pipe line transmission business . . . or if you contemplate having anything to do with pipe line transmission operations, don't sign any contract for power until you have carefully investigated the advantages of UTILITY ELECTRIC POWER. Of the 686,000 miles of pipe line systems in America, a big percentage of these is operated by Electric Power. When you have deliveries to make – at low cost – do it the modern, progressive way. Use UTILITY ELECTRIC POWER.



I'M LCP – Low-Cost Power on the Job 24 Hours Daily

PETROLEUM ELECTRIC POWER ASSOCIATION

P. O. BOX 2771 DALLAS, TEXAS

HOW TO GET ACCURATE INFORMATION IN CONSOLIDATED FORMATIONS

The *New* Schlumberger Combination Induction-Electrical Log

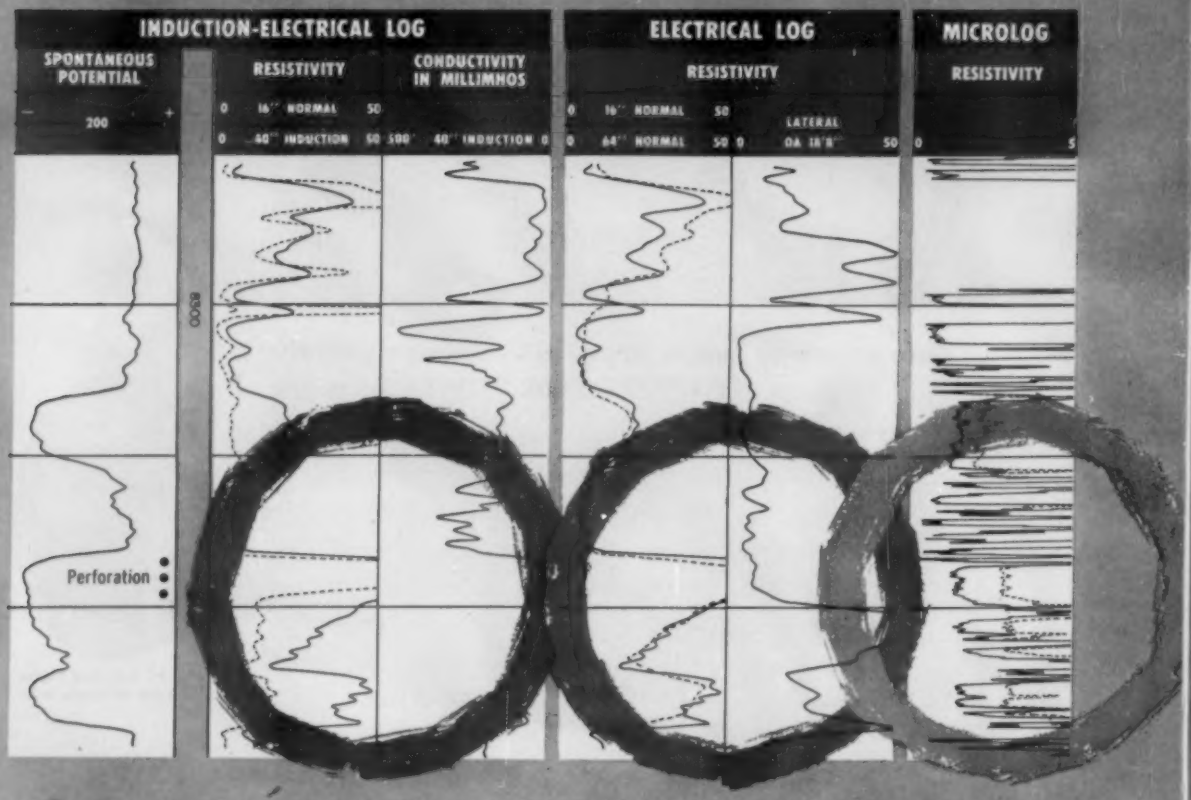
Sees More – Tells More

This example portrays the superiority of the Induction-Electrical Log in consolidated formations.

From top to bottom can be seen—sharp resolution in bed definition, penetration past the invaded section and curves with no distortion due to hard streaks or electrode spacings.

The producing section—is particularly outstanding because its limits are shown so clearly on the Induction Log while the electric log is difficult to interpret.

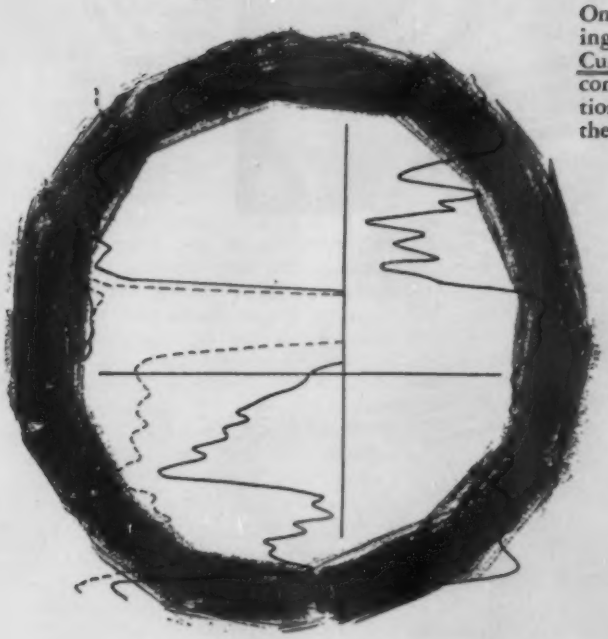
The perforated interval–produces 2.3 million cubic feet of gas per day with 20 bbls. of distillate per million.

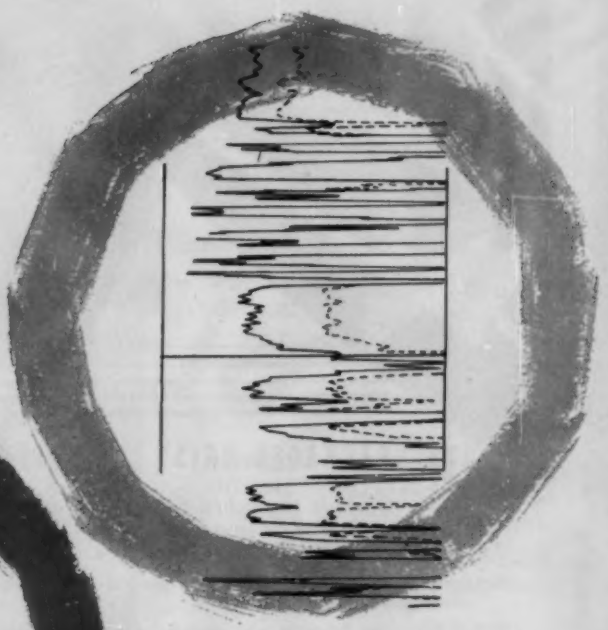


a major advance in well logging by Schlumberger

Formation evaluation

On the Electric Log, the sand is marked by high readings on the Short Normal, Long Normal and Lateral Curves. However, only the Induction-Short Normal combination clearly indicates the water-bearing section. The water level is well defined by the drop on the Induction Curve.





The high readings on the Short Normal and Long Normal Curves are the result of invasion. The lateral curve does not show the productive section at the top of the bed due to its characteristic lag. The lateral also gives high readings and misses the water in the lower section because of numerous hard streaks as shown by the MicroLog.

SCHLUMBERGER...Engineering for Better Service

The "PACKAGED UNIT" for PEAK PERFORMANCE

There's no puzzle to meeting the exacting demands of rough, off-the-road construction work when you depend on Leland's famous "Packaged Unit" for dependable service — trouble-free operation.

Headache Rack — for absolute safety to operator. Heavy duty hydraulic tubing frame, mounts spare wheel.

Winch Mounting Brackets — for strength, safety and adaptability to **all** winching jobs — with famous Tulsa Winches, if requested.

Gin Pole Pocket Settings — for double or single gin-pole use, bearing housings for rolling tailpipe, recessed in one-piece steel castings with gin poles.

Rolling Tail Pipe — seamless hydraulic tubing, mounted on shielded ball bearings, in special castings.

Flush Mounted Body Deck Plate — 2" hardwood flush mounted with steel — recessed snatchblock toggle, pole trailer bolster hole in tailboard.

Before you equip for your next job, you owe it to your pocketbook to see a Leland representative.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

They Say—

Oil states in competition

"There is only one method in which restricted production could result in price fixing. That would be for all oil-producing states to cooperate in creating an artificial shortage by reducing production substantially below demand.

"It is inconceivable that this could take place. It could not occur under the provisions of the Interstate Oil Compact. No state has ever restricted production below market demand. If it did so, buyers would turn to other states that would be eager to supply their requirements. States and areas within states vigorously compete for markets.

"There is no evidence whatever of collusion between the oil-producing states. Each is anxious to sell its oil, and they compete keenly in doing so."

Charlton H. Lyons, Shreveport, La., independent, and president of Mid-Continent Oil and Gas Association, in a speech at the Interstate Oil Compact Commission meeting, Yellowstone National Park.

Electric logging series

Dear Sir:

I have read with much interest the series of eight articles on Quantitative Log Analysis by Dr. R. G. Hamilton and Paul Charrin.

I sincerely believe the articles are of broad interest to the exploration side of the industry—sufficiently so, as to merit reprinting as a single pamphlet.

Will you please advise:

(1) If you intend to reprint as a single pamphlet?

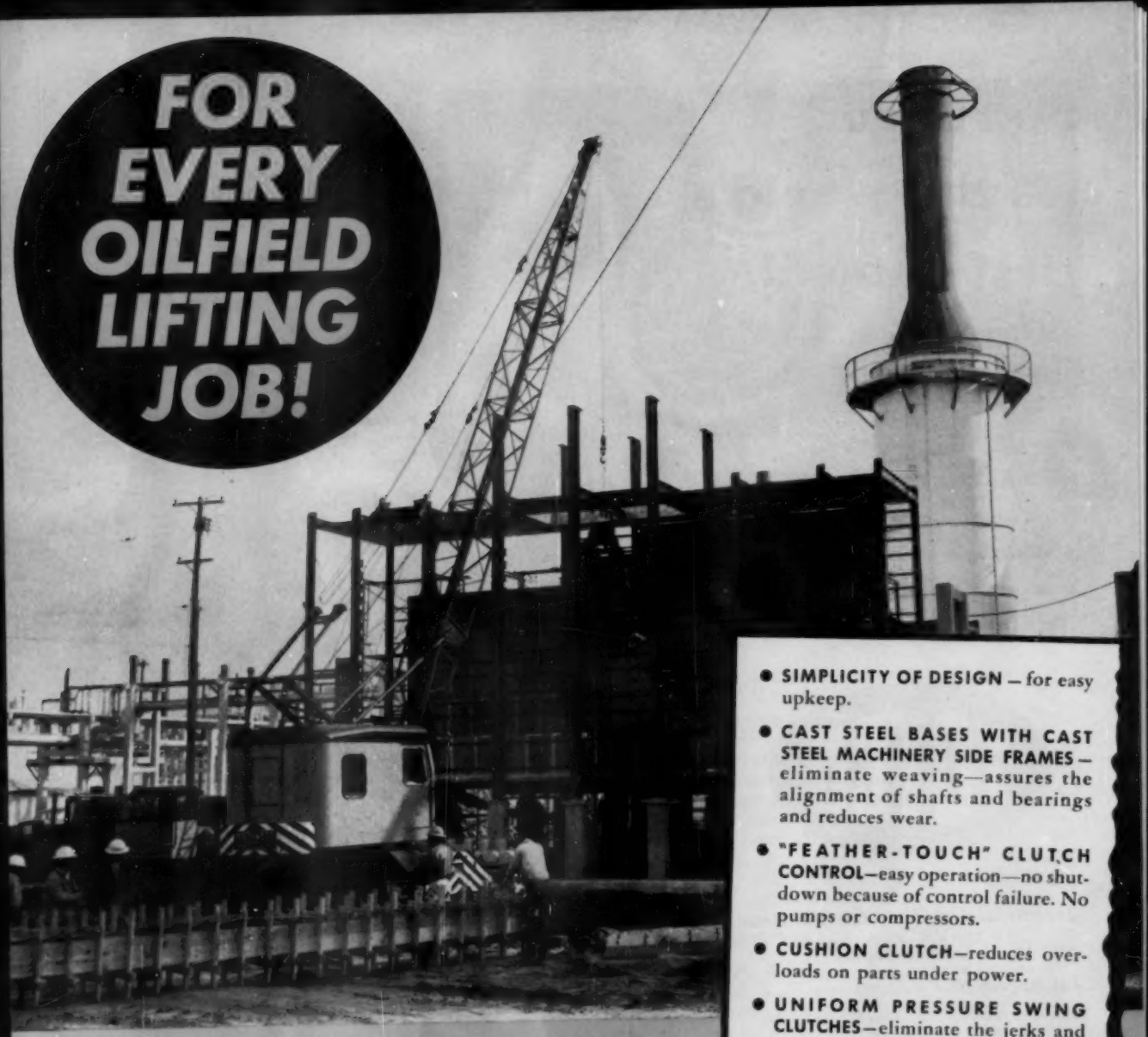
(2) If so, what will be the price and when available?

(3) If you do not intend reprinting, where may we secure copies of the assembled articles? We could use up to 10—what would be price for 1 and for 10?

F. C. Sealey,
Vice President and Consultant
American Overseas Petroleum, Ltd.
New York.

Editor's Note: Yes, this Journal series on electric logging is being reprinted. It will be available through the Journal's

FOR EVERY OILFIELD LIFTING JOB!



Mechanical trouble anywhere is a headache but in oil-field work it is perhaps more costly than anywhere else. Northwests are known for their ability to stay on the job. They are always ready to go. The "Feather-Touch" Clutch Control makes operation easy without resorting to delicate pumps or compressors and equipment that requires special knowledge to keep in order. Uniform Pressure Swing Clutches (and remember, no inside or outside band clutch is a uniform pressure clutch) give safer, smoother operation in setting things like valves, piping and heavy equipment. And remember, Northwest Carriers are far superior to the carriers offered on the ordinary Truck Crane. Designed and built to Northwest specifications they bring you advantages no other carrier can offer.

Add Northwest convertibility to this—simple convertibility made by an easy change of boom from crane or dragline, to shovel or pull-shovel—to handle the job with the most efficient tool.

Look over the Northwest advantages listed here and plan ahead to have a Northwest. A Northwest man will supply complete details.

- **SIMPLICITY OF DESIGN** – for easy upkeep.
- **CAST STEEL BASES WITH CAST STEEL MACHINERY SIDE FRAMES** – eliminate weaving—assures the alignment of shafts and bearings and reduces wear.
- **"FEATHER-TOUCH" CLUTCH CONTROL**—easy operation—no shut-down because of control failure. No pumps or compressors.
- **CUSHION CLUTCH**—reduces overloads on parts under power.
- **UNIFORM PRESSURE SWING CLUTCHES**—eliminate the jerks and grabs that set a load to swinging.
- **BALL AND ROLLER BEARINGS ON ALL HIGH SPEED SHAFTS**—minimum power loss to friction.
- **NORTHWEST WORM BOOM HOIST**—boom up—boom down—no jumping, no chattering, just velvet action under power both up and down. Independent High-Speed Boom Hoist available if desired, giving a choice of 1, 2 or 3 load lines.
- **EASY CONVERTIBILITY**—all Northwests are easily converted to Shovel, Dragline or Pullshovel.

THE GREATEST COMBINATION OF PROVED ADVANTAGES EVER BUILT INTO A SHOVEL, CRANE, DRAGLINE OR PULLSHOVEL

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Canadian cold or Arabian heat—
the tough TOTCO double recorder is a
little giant when it comes to
withstanding shock, pressure or heat
below ground, or the extremes of
weather above ground. That's why
most oilmen the world over say,
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Reader Service Department, P. O. Box 1260, Tulsa 1, as a 24-page booklet, price 50 cents per copy.

Underground corrosion

Dear Sir:

Your article in the March 11 issue of the Journal on underground pipe corrosion has proved to be most interesting to me in that there is a direct corollary in the corrosion of some roof bolts in coal mines from essentially the same apparent reason. We have had numerous inquiries as to the cause of corrosion of these coal mine roof bolts.

George M. Wilson
Geologist and Head, Educational Extension Division
Illinois State Geological Survey.

Shrinking market outlet

"Crude-oil imports during the Suez crisis were reduced to approximately their 1954 proportionate relationship to domestic production. If this relative position were maintained during the last half of this year with crude-oil imports not exceeding 800,000 bbl. daily, the market for domestic crude would average about 7,500,000 bbl. daily.

"If, on the other hand, crude-oil imports should increase to the level of 1,260,000 bbl. daily as reported to the Office of Defense Mobilization, the market for domestic crude oil would average only 7,040,000 bbl. daily—less than the pre-Suez production level.

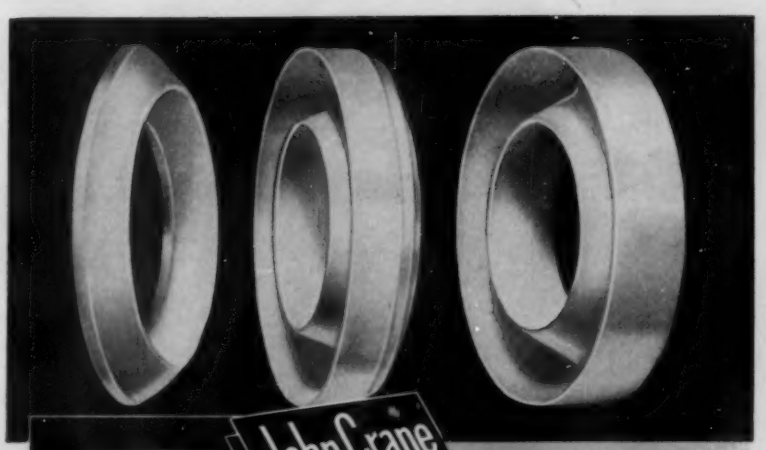
"The plans of the importing companies as submitted last month to the Texas Railroad Commission show the domestic producing industry is face to face with the lower range of close to 7,000,000 bbl. daily in market outlet."

Minor S. Jameson, Jr., assistant to the president of Independent Petroleum Association of America, in a speech before the Interstate Oil Compact Commission meeting.

The measure of success

"We . . . must clearly understand this necessity for survival in today's world—a successful business system.

"Of course, there are many criteria for measuring the success of an economic system—adequate employment opportunities for those willing and able to work, equitable wages, rising living standards, and expanding producing facilities to make our economy productive. These, although important, are only part of the story in a free enterprise system such as ours. The ultimate measure of the success of our system is adequate profit . . . In our entire economic history our people have never enjoyed prosperity without busi-



John Crane

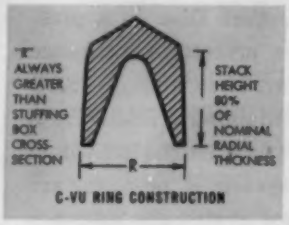
CHEMLON*

C-V RINGS

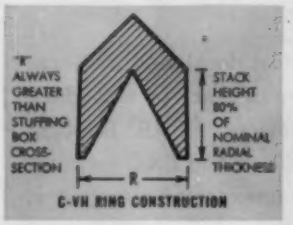
ARE INDUSTRY'S MOST UNIVERSAL PACKING . . .

Countless successful applications of C-V Rings under the most severe service conditions have made this the closest approach to a universal packing.

It will effectively handle all industrial acids, alkalis, solvents, organic and hydraulic fluids . . . temperatures from −120°F. to +500°F. . . . is equally suited to valves, pumps, mixers, hydraulic cylinders and like equipment.



C-VU RING CONSTRUCTION



C-VH RING CONSTRUCTION

"John Crane" C-V Rings have extremely low coefficient of friction. "Breakout" friction is only slightly higher than running friction.

TWO STYLES ARE AVAILABLE:

C-VU RINGS ***for low pressure service*** —such as control and regulator valves handling gases and fluids, where it is necessary to have a very sensitive and resilient type packing.

C-VH RINGS ***for high pressure service*** —for use in pumps, hydraulic cylinders and like services at pressures ranging to 500 psi. and over. These rings are constructed with a heavy wall heel to withstand pressure requirements. They are designed to provide voids between rings, so that as the Teflon expands due to heat, this take-up room minimizes any excess friction in the stuffing box.

"John Crane" C-V Rings are available in full line of standard sizes and male and female adaptors. Sizes can be molded to stuffing box specifications.

Request Bulletin P-325.

*"John Crane" C-V Rings are made from Chemlon—*the best in DuPont Teflon.*

Crane Packing Co., 419 Oakton St., Morton Grove, Ill. (Chicago Suburb). *In Canada: Crane Packing Co., Ltd., Hamilton, Ont.*

These BS&B
Rupture Discs Can Give
Your Pressured System...
Standard Rupture Discs, prebulged... available in a broad range of sizes, pressures and metals.
Vacuum Supports . . . installed under prebulged rupture discs to prevent their collapse under vacuum; fit exact disc contours.
Plastic Linings... and coatings for protection of prebulged discs under any specific corrosive condition.
Model D & DV Rupture Discs... for high temperature, pulsating pressure and corrosive services. Model DV includes vacuum support.
Model 1A & 1B Rupture Discs... for lower rupture pressures than prebulged discs; excellent for corrosive services. Model 1B includes flat vacuum support.

Positive Pressure Protection From 3 To 50,000 PSI

Installing a BS&B Rupture Disc on a pressured system provides protective insurance against a major disaster. Thousands of BS&B Safety Heads, each containing a BS&B Rupture Disc custom made to meet the individual requirements of the system it protects, are now guarding pressured systems in all types of industries.

Fully accepted by most local and national codes for use as either primary or secondary pressure relieving devices, BS&B Rupture Discs can be *your* positive and final measure of protection for the unexpected emergency.

THE "CIRCUIT BREAKER"
of Pressured Systems

Why not talk it over with your BS&B Representative... or write for further information to...

BS&B — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

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Kansas City 26, Missouri

ness being profitable and, conversely, profits have never been adequate without prosperity predominating throughout the land."

Richard F. Sentner, executive vice president-commercial, United States Steel Corp., in a speech before the National Association of Purchasing Agents.

Import action in Congress?

"We have appealed to the President for protection against the heavy flow of imported oil but as yet, we have not had a satisfactory solution from that source.

"Many of us have decided that the only way we will be able to have effective controls and protect our own oil-producing states is through congressional action."

Raymond Gary, governor of Oklahoma and chairman of the Interstate Oil Compact Commission, in a report at the commission's annual midyear meeting, Yellowstone Park.

Business growth under taxes

"A discriminatory tax on corporations . . . would erect a solid barrier to future progress . . . curtail the funds they need for future investment, penalize their efficiency, and offer the venturesome only the prospect of a precipitous decline in rate of return.

"The tax structure should encourage, or at least not penalize, industrial growth and expansion . . The nation needs a continuous flow of new ideas, and of the investment funds required to make them commercial realities . . . Rate reductions in individual taxes to provide adequate incentives for new ideas and new investment would cause only a small and temporary loss of revenue for the resultant stimulation to business would soon increase the number of dollars flowing into the United States treasury."

"The Story of Taxes," booklet published by E. I. du Pont de Nemours & Co.

1957: Year of investigators

"The year 1957 probably will see more federal investigations of the oil industry than any other year in the past 40.

"The oil industry has never resisted or questioned the power of Congress to investigate it. It has a good story to tell and nothing to hide . . . But some of the current attacks on the industry have a 'get oil' flavor about them . . .

"The investigations . . . are hampering oil industry operations. Oil people

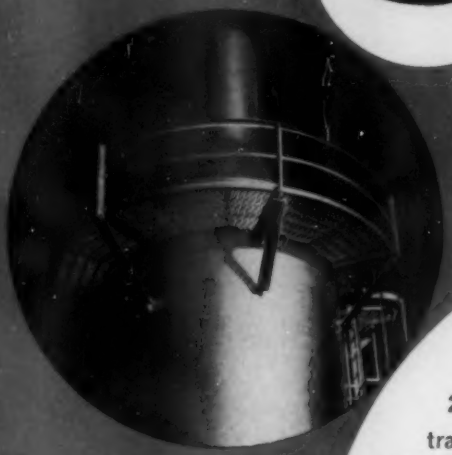
you can judge

the comparative values of furnace design as applied to operating requirements.

It's quite simple

there are 9 basic factors

which must be evaluated to obtain the full comparison of values



1—Average radiant transfer rate. **2**—Maximum deviation from average radiant transfer rate. **3**—Average and maximum transfer rate in convection section. **4**—Maximum tube wall temperature, radiant or convection. **5**—Maximum efficiency with specified excess air. **6**—Controlled thermal recirculation of flue gases to provide even heat distribution throughout full length of each tube and equalized heat distribution around each tube. **7**—Overload and corresponding transfer load. **8**—Design to provide: structural column supports - Ladders - Platforms - Tube Removal facilities, etc. **9**—Degree of assembly; of the furnace structure and of the heating surface.

Whenever all these 9 specifications are applied to all the operating requirements, you can be sure PETROCHEM ISOFLOW FURNACES will be found most economically desirable.

No other furnace design can claim the recognition and acceptance achieved by PETROCHEM ISOFLOW FURNACES . . . starting with one installation in 1940, January '57 records more than 1650 ISOFLOW FURNACES in operation and under construction—a record that is incomparable just as all Petrochem Isoflow furnaces are more economically desirable by any comparison.

PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

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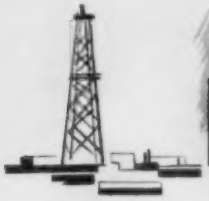
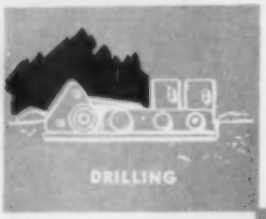


IN THE WORLD

OF PETROLEUM . . .

ENSIGN

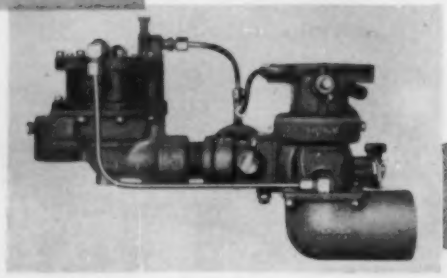
LEADS THE FIELD



Gas Engine Carburetion

Gas engines operating in the remotest parts of the world, frequently in the hands of the most inexperienced, must be easy to start, easy to operate and easy to service. This calls for gas carburetion that is simple in design and rugged in construction. Toward this end ENSIGN engineers have concentrated their efforts and resources for nearly half a century. Results of this concentration of purpose are measured in terms of unparalleled gas engine performance. Proof of this comes in a quick glance at the gas engine market. Today hundreds of thousands of ENSIGN carburetors are in a 'round-the-clock operation throughout the world rendering indisputable evidence that engines equipped with ENSIGN can be depended upon to perform well under all conditions.

DEALERS AND DISTRIBUTORS IN ALL PRINCIPAL OIL FIELDS



ENSIGN

CARBURETOR COMPANY

1551 E. Orangethorpe, Fullerton, California

Branch Factory: 2330 W. 58th Street, Chicago, Illinois

are kept away from their primary job, which is to produce and market oil. They are tied up with days and weeks of hearings when they should be working in their offices or in the field. They are hampered in their planning for future operations and expansion.

"Any act that reduces our capacity to maintain a good supply of oil at a reasonable price will lower our standard of living and weaken our national strength. It does not matter whether the act comes from ignorance, carelessness, or a hunger for votes."

"Why Pick on Oil," article in the plant publications of National Supply Co.

CALENDAR OF EVENTS

JUNE

24-28 American Institute of Electrical Engineers, summer general meeting, Sheraton-Mount Royal Hotel, Montreal.

26-29 American Association of Cost Engineers, first national meeting, University of New Hampshire, Durham, N. H.

JULY

8-19 Industrial Statistics for the Process Industries, second annual conference, sponsored by American Society for Quality Control and the University of Oklahoma, Lockett Hotel, Norman, Okla.

AUGUST

1-3 Rocky Mountain Mineral Law Foundation, third annual institute, Montana State University, Missoula, Mont.

19-20 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.

5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.

8-13 American Chemical Society, 132nd national meeting, New York City.

9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

9-11 American Institute of Electrical Engineers, petroleum industry conference, Sheraton Hotel, Philadelphia.

11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.

19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.

22-25 American Society of Mechanical Engi-

Easy, Quick to Check Out....
Place a single purchase order
for pressure vessel and internals

Glitsch

Many operators place a single purchase order with Glitsch for both the tower internals and the pressure vessel itself in order to save time and money and to afford a more efficient operation. One inspector can check out the entire job—which also saves time and expense. Glitsch is completely equipped to fabricate any design and type of pressure vessel—built exactly to our customer's process specifications—according to all code requirements, at competitive prices, and with a quality of workmanship that is unexcelled by any other plant in the industry. A complete set of drawings is furnished with every job and the services of Glitsch field personnel are always available when required. No job is too small nor too large; we can fabricate vessels as large as 12½′ x 162′, completely equipped with walkways and platforms.

Calling in a Glitsch man at the earliest possible stages is one way you can be sure that regardless of the process, your project will be expertly engineered and fabricated. Your nearest Glitsch representative will be glad to give you illustrated literature and additional details on this and other Glitsch equipment without obligation. Fritz W. Glitsch & Sons, Inc., P.O. Box 6227, Dallas, Texas.

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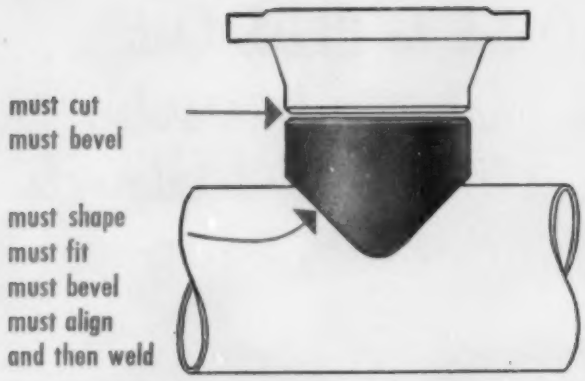
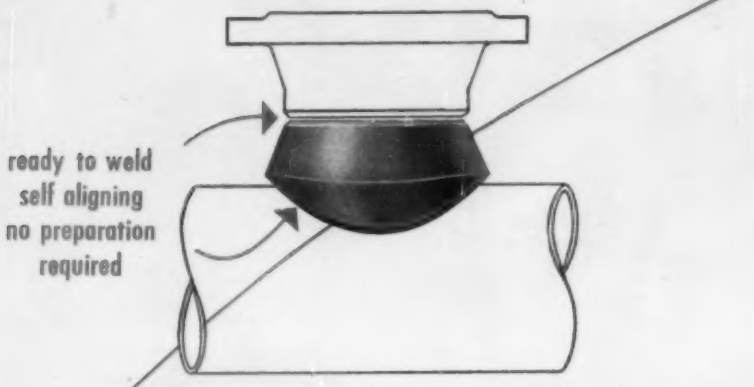
Glitsch Packaged Units
—Towers and Internals



short nozzles DON'T PAY...



BONNEY WELDOLETS DO!

Even on low pressure piping . . . avoid non-productive preparation time . . .
SPECIFY and USE WELDOLETS

No joint preparation is required for *either* weld of the Weldolet, whereas considerable preparation is required for *both* welds of the miter branch construction.

The integral reinforcement of the Weldolet Welding Fitting has established it as an ideal method of constructing branch connections on high pressure and/or high temperature piping. This feature is *bonus insurance* on low pressure piping where the Weldolet is easier and more economical to use than preparing the two ends of a short unreinforced nozzle.

Sold through leading Distributors in Principal Cities

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ALLENTOWN, PENNSYLVANIA

neers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

23-25 American Society of Mechanical Engineers, fall meeting, Statler Hotel, Hartford, Conn.

26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

26-27 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, Roosevelt Hotel, New Orleans.

30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

OCTOBER

1-2 Texas Mid-Continent Oil and Gas Association, thirty-eighth annual meeting, Texas Hotel, Fort Worth.

2-4 Golden Trend Oil Show, Pauls Valley, Okla.

6-9 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fall meeting, Adolphus, Baker, and Statler Hilton Hotels, Dallas.

7-9 American Gas Association, annual convention, Kiel Auditorium, St. Louis.

7-11 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

10-11 California Natural Gasoline Association, thirty-second annual fall meeting, Huntington-Sheraton Hotel, Pasadena.

10-12 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, fuels conference, Chateau Frontenac, Quebec.

13-15 American Association of Oilwell Drilling Contractors, seventeenth annual meeting, Mayo Hotel, Tulsa.

13-19 OIL PROGRESS WEEK.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southern California petroleum section, fall meeting, Biltmore Hotel, Los Angeles.

17-19 Four Corners Geological Society, second field conference, Gallup, N. M.

20-22 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Peabody, Memphis.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington-Youree and Captain Shreve Hotels, Shreveport.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional meeting, Cimarron Ballroom, Tulsa.

NOVEMBER

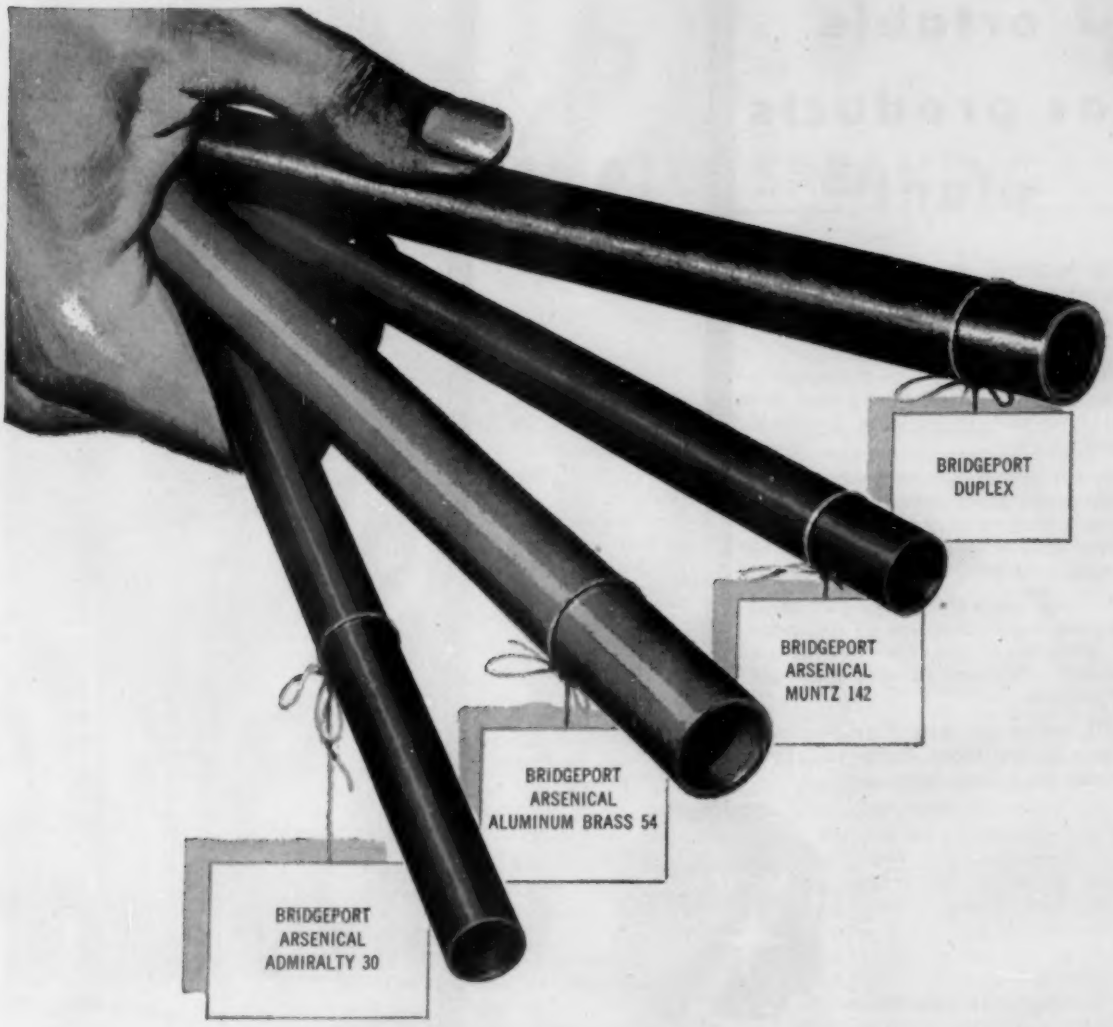
3-8 Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.

6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.

11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.



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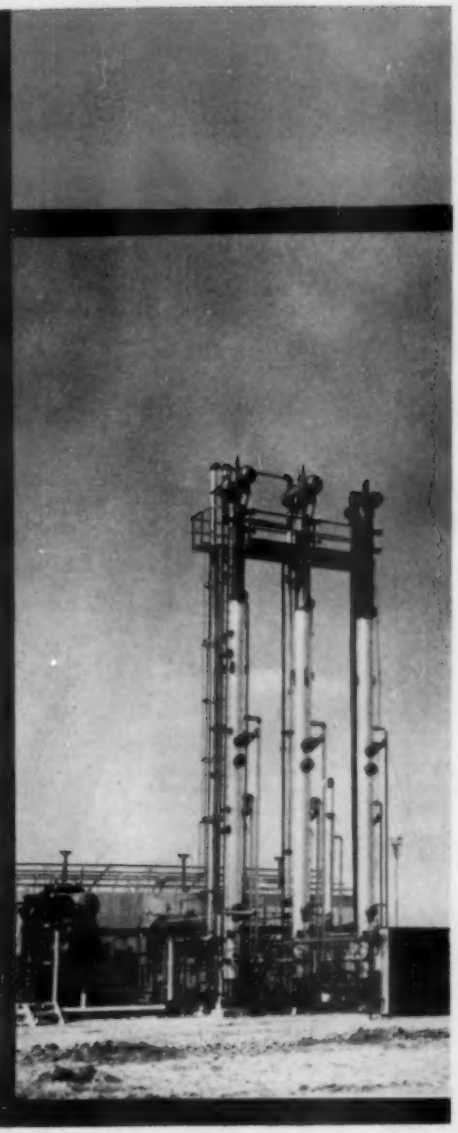

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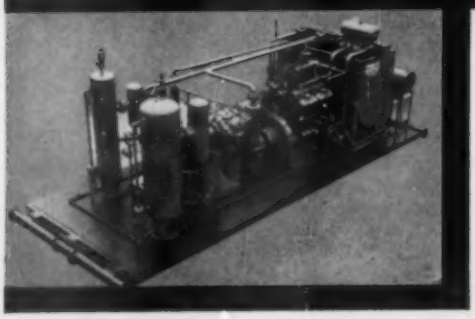

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY SPEAKING

Clipping Service

"YOUR Oil and Gas Journal doesn't suit me at all," a friend told us half seriously the other day.

"Oh, I admit I can't get along without it, but you don't print it the way I want it. As a matter of fact, I never have seen a magazine that suited me, and I suppose I never will."

"What do you want? Egg in your beer? A comic supplement maybe? In six colors yet?" we inquired solicitously.

"Nope. It's very simple. I just want all editorial matter printed on only right-hand pages and all advertising printed on left-hand pages—and all pages perforated so they can be torn out easily."

"Oh you're a clipper," we said scornfully. "Don't you care how a magazine looks? Don't you like those beautiful spreads where an article opens across facing left and right pages?"

"I hate spreads," he replied. "It just means that I have to turn a page over before stapling the article together."

"How lazy can you get?" we sneered. (We were pretty sure this fellow wasn't going to cancel his subscription as a result of our insults). "You don't want a magazine. You just want a loose-leaf reference service."

"That's right," he agreed. "I never read your darned old rag, you understand. I just cut it up and file the pieces by subjects in case I ever want to refer to something in the future."

He lied in his teeth. We happen to know that he does read a lot of the Big Yellow Book every week before hacking it up, because he frequently comments on it and usually in a complimentary way.

But while this guy wasn't serious, we do get some serious letters from readers plaintively asking us to make the book easier for clipping, especially by not backing up one article with part of another.

We know that some 40 per cent of our subscribers regularly clip certain parts of the Journal for filing. And in the last couple of years we have made a lot of changes in our layout policy and printing schedule to accommodate them.

First, we have eliminated all "jumps". You never find an article "continued on page so-and-so", with the tail end strung out in the back of the book. It's printed all together, in one compact, contiguous package. This was done primarily to make it easier for readers, but it ought to be a big help to those who merely flip and clip.

Second, we never back up two articles on related subjects on opposite sides of the same sheet. A refining article, say, will be backed up with maybe a drilling article. Our theory here is that clippers are usually specialists and normally don't give a hang about something out of their line.

But still we occasionally get letters from people who want to clip everything and object to having any editorial material printed back to back.

We're sorry, but we've gone just about as far as we can—because of mechanical limitations—to please the clippers. Printing a magazine involves about as many technical complications as drilling and completing an oil well, and it's difficult to explain either process to a layman. You'll have to take our word for it.

And besides, while we are flattered that so many people consider our articles worth filing permanently, our main concern is with people who really read our favorite oil publication. We strive mightily to make it easy to read.

One of our gimmicks is extensive use of spreads (which the clippers detest). We think it aids readership to display an article across facing pages, particularly if there is art work that ties in with the headlines.

We've also made dozens of other improvements (we think) in what we call the art of article presentation, all to make the book look better and read easier. What we did to please the clippers wasn't easy, and we've gone about as far as we can go to meet their problem.

—Henry D. Ralph.

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Don't jump to conclusions over the drilling slump

So far this year the United States appears to be finding less oil than it is producing. Only once before in recent history has this been the case.

This situation is sobering but not necessarily alarming. Certainly it is no cause for hysterical arguments and unwarranted conclusions about our oil supplies for the future and the current problem of imports.

The consuming public may jump to the conclusion that we are running out of oil fast and therefore should import all we can and hoard our remaining precious little supply. Producers may say that if imports are shut off they can find all the oil we will ever need.

THE TRUTH is somewhere in between these extremes.

A part of the reason we are finding less oil this year is that fewer wells have been drilled than last year. And a part of the reason for the drilling slump is that incentives have been lessened by the prospect of heavy imports. But there are other reasons for the slump, ranging from bad weather to tight money.

Unquestionably there is much oil remaining to be found in the United States. It will be found only by drilling. Anything that stimulates drilling, such as a better market prospect caused by lower imports, should increase the discovery rate.

But it does not follow that we can, or should try to be, completely self-sufficient in oil. With consumption rates and finding costs both increasing so steadily it is likely that we will want to use increasing quantities of foreign oil year by year.

The problem is to make effective the established national oil policy that imports should supplement but not supplant domestic production. The imports rate should be changed as conditions change.

THE REALIZATION that during the last few months we have found no more oil than we produced is not by itself the decisive factor in the imports question. It may be a short-term phenomenon and it may be due in large part to conditions other than imports competition.

The market impact of imports is only one of many factors that should be considered together in forming a long-range policy to assure ample future supplies of oil without unreasonable prices to consumers. Other elements include depletion, inflation, conservation, and defense.

As of now it does appear that a moderate curtailment of imports would help to increase the drilling rate. If this is done and if drilling does not then pick up, other causes of the slump should be examined. If more drilling fails to improve our reserves position, or if it becomes apparent that substantial reserves can be added only at unreasonably high costs, the imports supplement most certainly should be increased.

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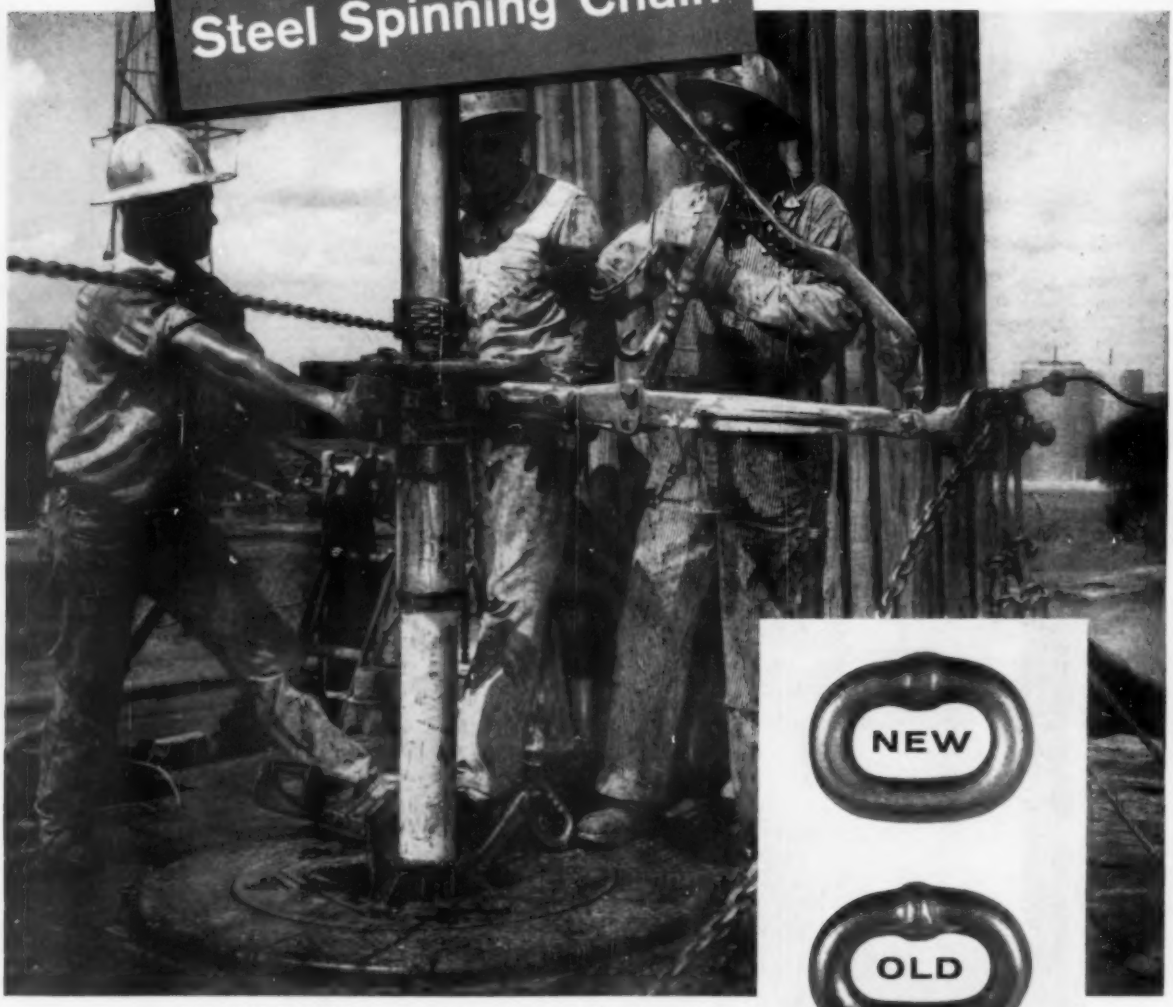
NEW WELD



NEW WELD DESIGN is demonstrated by the actual link photos shown here. Re-shaping of link ends before welding produces smoother welds. Wear on gloves is reduced, even at higher spinning speeds. Link design and steel analysis permit pre-determined elongation to absorb shock of heavy-duty operation.

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Republic's new, link weld design is representative of the attention to detail that makes Republic Alloy Steel Spinning Chain top choice for efficient, economical joint make-up. Using a Republic-controlled, special analysis alloy steel, experts at our Bolt and Chain Division produce spinning chain specifically designed to withstand the shock, abrasion, and fatigue of heavy-duty oil field operations. Chain is heat treated to provide immense strength and toughness—the basis for a wide margin of safety. Final step in a complete quality-control program is proof testing of completed chain. A test certificate will be furnished on request.

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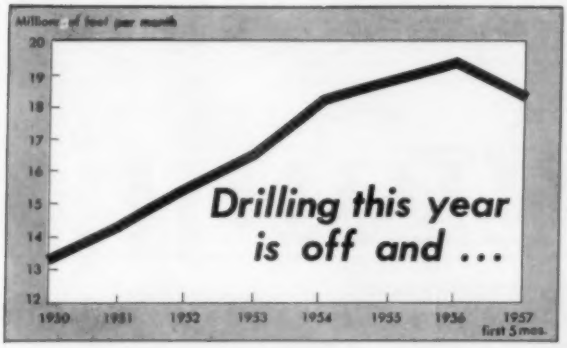
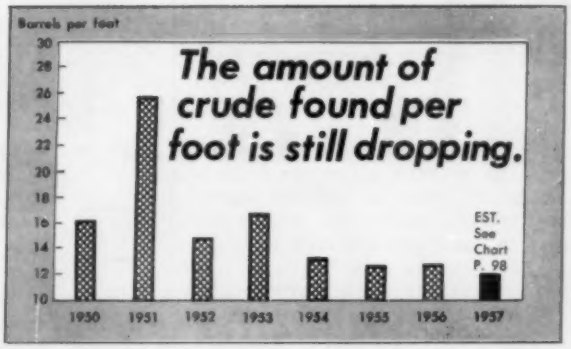
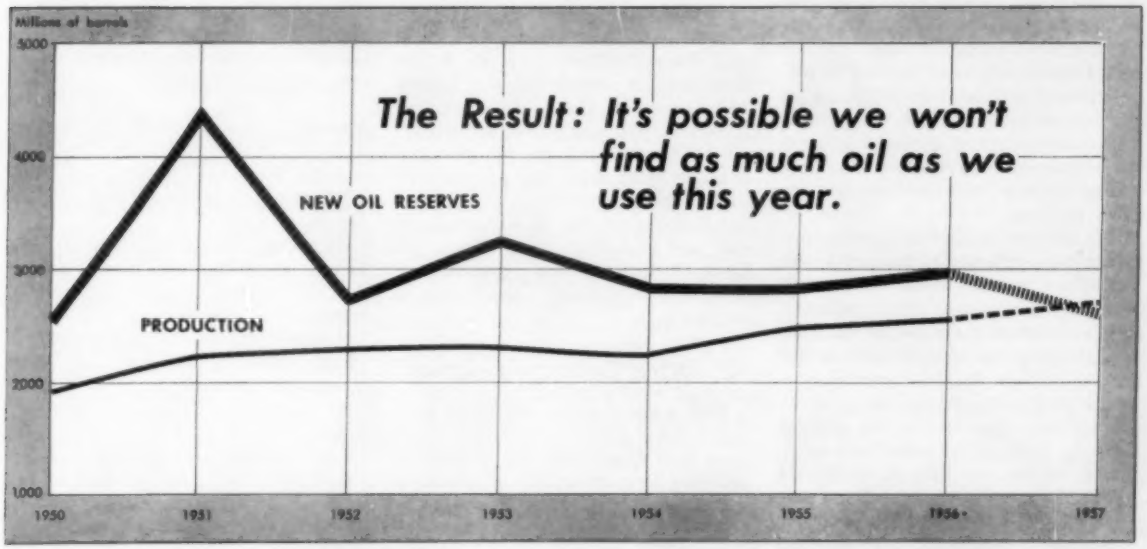
the OIL AND GAS JOURNAL

June 24, 1957







The Drilling Slump: How Bad? Why?

DISCOVERIES are running neck and neck with production this year.

Unless drilling picks up strongly and soon, there's even the possibility that we won't find as much new crude as we produce this year.

Only once in recent history—the abnormal war year of 1943—has the industry failed to end the year without a net addition to reserves. But this year the industry is running fewer rigs, completing fewer wells, and drilling less footage.

There's no single explanation for the drilling slump. Reasons vary widely among the operating companies. There's still a lot of optimism among exploration people and drilling contractors alike, but as the industry nears the end of the first half the drilling letdown is a fact—and one which can't be overlooked. In brief, here's the picture for the first 5 months:

... **Completions are off** 9 per cent. As of June 1, the domestic industry had drilled only 22,041 oil and gas wells, compared with 24,222 during the same period last year.

... **Footage is down** 7.4 per cent. Operators have drilled only 91,489,000 ft. of hole. This is 7,388,000 ft. less than was drilled during the same period in 1956.

... **It seems certain** the industry will miss its estimate of 60,057 wells this year.

The drilling dip, coupled with a downward trend in the amount of oil found per foot of hole, indicates that less oil is being found this year. Together with the fact that production is still climbing, this means 1957 may turn out to be one of the poorest years in recent history in additions to reserves (chart).

If the industry finds 12 bbl. per foot of hole drilled this year (see

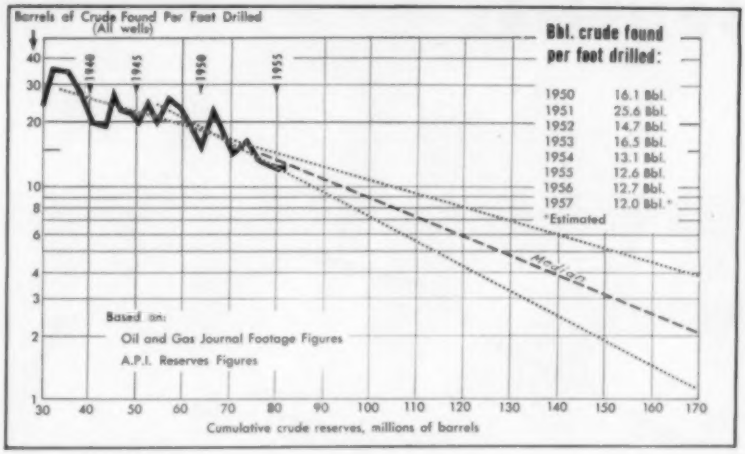
chart, at right, and drilling continues at its present rate, production will actually exceed the amount of new oil found.

During the first 5 months, crude-oil production totaled 1,130,000,000 bbl. But new crude reserves, based on discovery of 12 bbl. per foot drilled, amounted to only 1,098,000,000 bbl.

If drilling continues at the same rate, and if the discovery rate is 12 bbl. per foot, new discoveries this year will total 2,600,000,000 bbl., a drop of 12½ per cent below last year's 2,974,336,000 bbl.

This doesn't mean that we're running out of oil. It means simply that so far this year the industry hasn't put enough money into drilling to find the oil it can and must find.

How One Major Sees Drilling Returns



1. Where Drilling Is Down

Hardest hit by the drilling slump are the independents, both large and small. Well over half of the independent operators polled by The Oil and Gas Journal said their drilling is off. Many have slashed their programs 50 per cent or more.

In contrast, many of the integrated major companies say their drilling programs are the same as last year, or show increases.

But it's the smaller companies (excluding the nation's 30 largest) which drilled 75 per cent of last year's field wells and 83 per cent of the wildcats. When the smaller companies cut their exploration programs, the effects will surely be felt in development programs next year, and the next.

Oklahoma has taken the biggest beating. Only 2,665 wells were completed during the first 5 months of 1957. This is 28 per cent below last year's 3,706 during the same period.

Kansas completions have tumbled 19½ per cent, from 2,124 in 1956 to only 1,712 this year. Illinois has the biggest percentage decrease—nearly 32 per cent (see chart).

But the drop is not confined to Oklahoma, Kansas, and Illinois. North Louisiana, the Texas Gulf Coast, Mississippi, Southwest Texas, Colorado, Nebraska—all are down.

Some areas, including California, Montana, North Central Texas, and Indiana, are just about the same as last year.

Where drilling is up . . . Operators lament that oil is getting harder to find, and that there are only two really big plays going on right now. And these are out of reach of many of the smaller companies:

. . . Offshore Louisiana, where it costs as much as a million dollars to drill one well, shows an increase of nearly 50 per cent so far this year (see chart). But the costs are prohibitive for many operators with limited facilities.

. . . Four Corners area in Rocky Mountains is considered the hottest inland spot this year. Utah's completions have nearly doubled. But the locale is remote, and the big development program can't really get started until pipelines are built.

Arkansas drilling is up considerably, and East Texas, West Texas, the Texas Panhandle, and New Mexico are more than holding their own so far this year.

2. Why Drilling Is Down

Pick a dozen operators whose drilling is down. Chances are that you'll get a half dozen different reasons. In one way or another they all tie in together, and boil down to this:

. . . Wells are deeper and costlier.

. . . The crude-oil market situation is worrying some producers.

. . . Price is uncertain, despite the 25-cent increase earlier in the year.

. . . Money is getting scarce and more expensive. Investors seem to be more reluctant to take a chance. Even the wildcatters are becoming more cautious about where they spend money. And interest rates have risen.

. . . Funds have been diverted abroad and offshore.

. . . As a result it's harder to find oil. A company has to drill almost three times as much footage to find as much oil as it did 20 years ago.

To top it all off, the weather has upset the timetable, especially in the Mid-Continent area, where drilling crews were getting accustomed to a 6-year drought. Floods have plagued operators in Oklahoma, Texas, Kansas, and other areas. One independent had a road washed out eight times in Harper County, Oklahoma.

All these factors have combined to make oil men and investors more conservative—to the point where completions are down 9 per cent.

Money . . . One company, which does a lot of drilling in South Louisiana and the Texas Gulf Coast, says "outside" money is being left out of drilling budgets.

Increased costs and greater drilling depths scare the risk capital which would normally come from outside the industry.

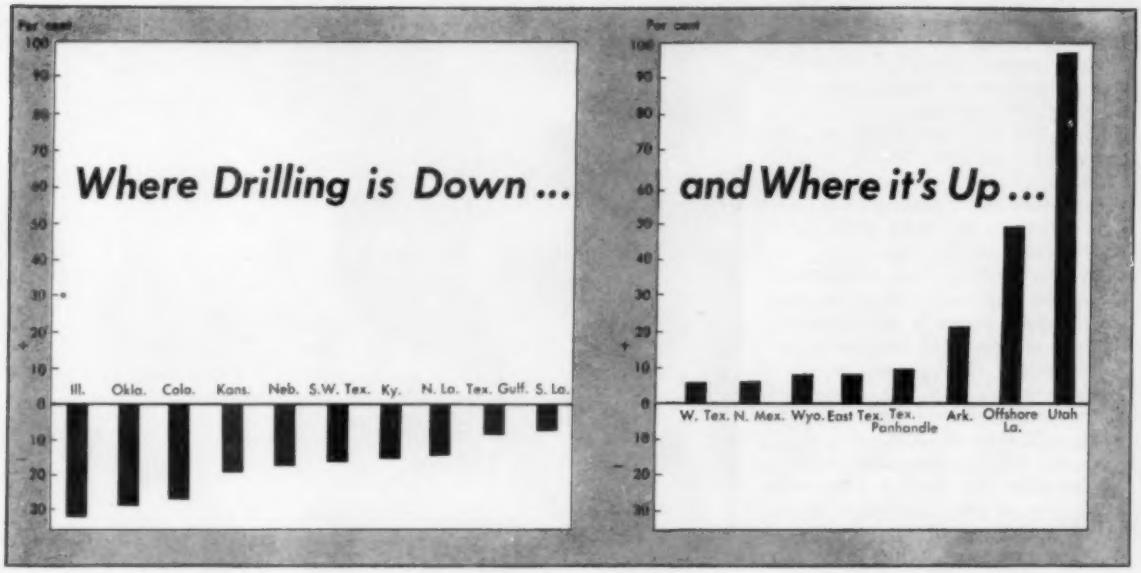
Citing Louisiana as an example: A greater number of wells in South Louisiana are now going to 14,000 and 15,000 ft. They cost anywhere from $350,000 to $700,000 per well. If these costly wells hit gas and distillate pay, and can't produce it because of lack of pipeline connections, investors have big money tied up indefinitely.

That way, a man can strike it rich and go broke in the process.

An Oklahoma oil man puts it another way. He says investors outside the industry are becoming more "educated" about the great risk involved, not only in finding oil but in marketing it. The nonoil people are reluctant to plow their money into an oil or gas crop that may not yield as quickly as they think it should.

This "education," coupled with higher interest rates on borrowed money, the slight slump on the stock market earlier in the year, and political and price uncertainty, has caused what one oil man describes as a general "hesitancy."

Several independent operators told The Journal that their incomes were down in 1956. "With higher costs and



deeper drilling," said one, "we can't afford to drill as many wells as we did last year."

Another, whose profits were down, said his company is becoming cautious to the point of selling some of the oil properties which the company would normally keep.

Drilling contractors, whose profits are down, are not drilling as many wells for themselves as they normally do, and they're not promoting as many deals.

Deeper drilling . . . Companies, large and small, are winding up shallow-drilling campaigns and turning to the more costly deeper production.

Some shallow areas in Illinois, eastern Kansas, northeastern Oklahoma, and North Texas have passed their heyday.

Now the operators are turning to deeper pay in western Oklahoma and Kansas, West Texas, New Mexico, and the Rocky Mountains—the more remote areas where pipeline connections are sometimes hard to come by.

The market . . . The operator who moves from shallow areas to deeper programs asks himself a lot of questions before he ties up big money in a risky business. Several factors have been bothering him lately, and they're slowly coming to a head.

. . . Imports. For the first time, worry of independent producers over the increasing flow of foreign oil is showing up in field activity.

During the Suez crisis and the European oil lift, U. S. operators wondered what would happen when things got back to normal. They found out when import schedules for the third quarter of 1957 were filed with the Texas Railroad Commission.

Importers plan to bring in more crude oil than they did before Suez. Imports will top a million barrels a day through September *(The Oil and Gas Journal, May 27, page 85).*

. . . Allowables. When the European oil lift ended, oil men wanted to know how long it would be before allowables started tumbling.

In Oklahoma, allowables were cut from 628,000 bbl. daily in May, to 598,000 bbl. daily in June. And it looks as though July will see a further reduction.

In Texas, producers have been cut to 13 producing days in July as compared with 18 in March (page 101).

Louisiana's allowables have been pared from nearly a million barrels daily in March to about 800,000 bbl. in July.

. . . Pipeline connections. Most of the complaining is from Texas, but in Oklahoma and Kansas operators are upset about the high cost of trucking oil.

One Texas company reports it has quit drilling in Texas areas where trucking is required to move oil to market. The same company was paying trucking costs of 90 cents a barrel to market some crude in southwestern Kansas and western Oklahoma last year. Although trucking costs are now down to 55 cents in those areas, the company has slowed down development there.

It's even worse when you have to wait for a gas connection, because gas can't be trucked. One company spent $800,000 and waited 3 years before it got a connection in its gas field in Texas. The same operator spent $175,000 to drill two gas wells in another Texas gas field, and had to wait 1½ years for a connection.

. . . Price uncertainty. When oilmen got a long overdue 25-cent crude-oil price increase early this year, many thought this would be an inducement to more drilling. But it wasn't. Apparently another price increase is needed to further make up for higher costs which operators have been absorbing right along.

Landowners want more money. And so do workers. Unions demanded and got another big wage boost—6 per cent.

Price of steel has been going up and up, and July may see another hike *(The Oil and Gas Journal, June 17, page 98).*

. . . Foreign investments. Diversion of funds for foreign operations is undoubtedly having an effect on domestic development.

One big integrated company, which recently invested heavily in new concessions in Venezuela, has cut domestic operations to meet South American commitments.

The company's U. S. completions were down nearly 38 per cent during the first quarter of 1957. And the company does not expect drilling to pick up during the last half of the year.

The reason: "We're allocating money where it will bring us greater returns." The over-all budget is bigger, but the company had to cut somewhere.

Majors' programs . . . A sampling of the major oil companies show they are generally holding their own this

year. Some are ahead of last year's drilling programs.

The Texas Co.'s 1957 domestic drilling program is keeping up with last year's drilling rate.

Shell Oil Co. operations are up considerably in both the U. S. and Canada.

Pan American Petroleum Corp. is just about at the same level as it was last year at this time.

Atlantic Refining Co.'s completions are up 18 to 20 per cent so far, and the company hopes to maintain that rate the remainder of the year.

During the first quarter of 1957, Sinclair Oil & Gas Co. completed a few more wildcats and field primary wells than in 1956.

Carter Oil Co. increased its drilling program the first 4 months of 1957, but showed a decided slump in the number of completions of "special agreement wells." These are wells in which Carter contributes either money, acreage, or drill sites in deals involving mostly independent operators.

3. The Outlook

The geologist has not lost his enthusiasm. To prove that the oil is there, he points to the Paradox basin in the Four Corners area, which is the nation's number one land operation at present.

Within a little more than a year's time, operators have turned up 500,000,000 bbl. of reserves in the Four Corners area. This looks even more successful when compared with offshore reserves. It has taken 10 years to find 1,000,000,000 bbl. of offshore oil—and at a much greater cost than it took to find Paradox reserves.

Geologists say there's plenty of oil, if the companies will only spend the money to find it. They feel that management has become too conservative, too cautious, and too tight with money in the past few years.

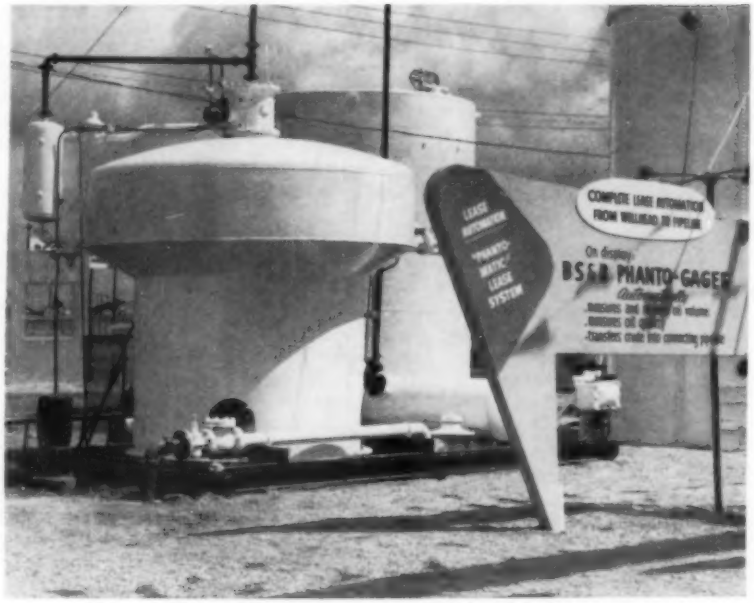
Mention to an exploration man that the U. S. is running out of drillable prospects. He practically shouts his answer: "I can show them plenty of places to drill."

But the question foremost in management's mind is: "Will it pay?"

Despite the economics involved, geologists say the oil industry needs imagination, more aggressive wildcatting. They say there is no doubt that as much oil lies undiscovered between 5,000 and 10,000 ft., as has already been found above 5,000 ft. Most production now comes from depths shallower than 5,000 ft.

As one geologist put it: The only reason it hasn't been found is that it hasn't been drilled.

From an early-day boom town to . . .


LEASE AUTOMATION "PHANTO-MATIC" LEASE SYSTEM
COMPLETE LEASE AUTOMATION FROM WELLHEAD TO PIPELINE
On display:
BS&B PHANTO-GAGER

Modern automatic custody transfer:

Exposition Tells Story of Oil

OKLAHOMA CITY.—Yesterday and today are linked in displays at the Oklahoma Semicentennial Exposition which started here June 14 and will wind up July 7.

The early wooden drilling rigs were erected by Tidewater Oil Co., Kerr-McGee Oil Industries, Inc., and Anderson-Prichard Oil Corp. To "build them like they used to," Anderson-Prichard searched the oil patch several months to find parts for a cable-tool rig of 35 years ago. It finally had Parkersburg Rig & Reel Co. build the bull wheels.

Below, a Phanto-Gager demonstrates automatic transfer of crude from lease to pipeline at clips of 25 bbl. per slug. It is displayed by Black, Sivalls & Bryson.

Production Will Drop

● As crude imports soar to all-time high, Texas slashes allowable to lowest number of producing days in state's history; Louisiana also schedules cutback

DOMESTIC oil producers will throttle down their wells sharply next month, as the industry starts making a major post-Suez adjustment.

This is the situation:

... **Texas has reduced** the allowable for July by 406,832 bbl. daily, cutting back to only 13 producing days.

... **Louisiana plans** to cut 30,000 bbl. daily from its July allowable.

... **Imports were pouring** in at an all-time record rate of 1,296,000 bbl. daily in mid-June.

... **Refinery runs dropped** 353,000 bbl. daily under pressure of voluntary cutbacks and plant strikes.

Historic action . . . The Texas cutback was the largest in state history. The Texas Railroad Commission ordered the reduction after being pressed feverishly by major crude buyers and reluctantly by independent producers to do something to avert a heavy buildup of crude stocks. Oil men feared such a buildup would lead to more pipeline proration this month and next and a situation bordering on chaos by August.

The commission, with heavy industry support, chose to cut and avoid a crisis rather than keep allowables at June levels in an effort to stave off imports.

Veteran commissioners said the cut was the largest in their memory. It was achieved by reducing the state's producing-day schedule to only 13 days for July. Never before has Texas had less than 14 producing days. The July allowable is 406,832 bbl. daily less than the initial allowable set for June and 393,000 less than the current allowable.

One commissioner, Olin Culberson, refused to go along with any reduction below a 15-day schedule. He did not attend the hearing but left a statement saying he felt deeply that "any further reduction in producing days... will have serious and adverse effect upon functioning of state governmental agencies which rely to such a great extent upon oil."

Storage bulging . . . Virtually every major crude buyer queried at the hearing said that his available storage would be full by late summer if allowables were held at 15 days.

Only one, Sun Oil Co., felt it could handle that much oil without getting into deep trouble. Nominations of the other majors ranged from 12 to 14 days with the majority favoring 13.

Magnolia Petroleum Co. said it could handle only 12 days due to strikes at refineries it normally supplys with crude. Atlantic Refining Co., which already has cut off some purchases, said it was going to storage with 19,000 bbl. daily. On 15 days, all its storage would be full by July 31.

J. G. Coates of Gulf Oil Corp. told the commission the situation amounts to this: If the commission doesn't cut, the purchasers would have to when the tanks filled up.

ALLOWABLE BY DISTRICTS
(Barrels daily)

District—	July	Change from June
1—Southwest	55,539	— 16,074
2—Gulf Coast	128,238	— 24,748
3—Gulf Coast	441,923	— 40,555
4—Southwest	219,353	— 26,511
5—East Central	37,276	— 4,463
6—Outside E. Texas field	126,847	— 15,506
6—East Texas field	174,429	— 28,720
7-B—N. Cent. Texas	179,917	— 16,509
7-C—W. Cent. Texas	153,221	— 40,774
8—West Texas	1,111,299	—151,557
9—North Texas	261,493	— 45,099
10—Panhandle	138,251	3,684
Total	3,027,786	—406,832

Independents act . . . Independents generally advocated the cut, too—but with much less enthusiasm.

J. J. O'Brien, new president of Texas Independent Producers and Royalty Owners Association, said TIPRO felt it had to recommend the cut despite the fact that it would "literally immobilize the production of petroleum within this state."

Spokesmen from other independent associations agreed that it was better to cut the allowable than to continue at the present rate and suffer the consequences of widespread pipeline proration and nonratable take.

Turning on the heat . . . Immediately after the hearing, four Texas independent producer groups fired off telegrams to oil-state congressmen calling attention to the Texas situation.

They said the cut jeopardized thousands of independents and undermined national security. They accused importing firms of precipitating the situation with unreasonably high imports. The wires called for "urgent and immediate action to curtail imports."

Too much oil . . . Louisiana Conservation Commissioner John B. Hussey remarked "there is just too much oil on the market" when he announced his state also would cut back production for July.

Hussey forecast Louisiana's allowable cut would be about 30,000 bbl. daily. This will make total July production about 800,000 bbl. daily. It's the fourth cut since the peak allowable of 990,642 bbl. daily during the Suez crisis last spring.

Hussey indicated the July cutback will be made by a further 2 per cent reduction in production allowed under the state's depth-bracket formula. This yardstick already is down 43 per cent of the basic formula set in March 1953.

Even with the July cutback Louisiana's allowable will be well above the ceiling of 749,000 bbl. a day which was in effect last October before the Suez Canal was closed.

Refiners slow up . . . The producers market — the domestic refineries— showed further signs of dwindling.

Refinery runs dropped 353,000 bbl. daily for the week ended 6 a.m. June 14, reports from the American Petroleum Institute said. Part of the decrease was due to voluntary reductions by refiners and part due to plants closed by strikes.

The cut in runs resulted in a drop in production of the four major products totaling 329,000 bbl. daily. Changes by products were:

... **Gasoline,** down 102,000 bbl. daily.

... **Kerosine,** down 40,000 bbl. daily.

... **Distillates,** down 88,000 bbl. daily.

... **Residual,** down 99,000 bbl. daily.

Stocks of the four major products increased 669,000 bbl. daily in the week compared with 765,000 bbl. daily the previous week.

Imports . . . The flow of foreign oil into this country is picking up a full head of steam following its slowdown during the Suez crisis.

Imports averaged more than 1,000,000 bbl. daily for each of the past 4 weeks. The peak was reached in the week ended June 14 with an all-time record of 1,296,000 bbl. daily.

For the 4-week period ended June 14, crude imports averaged 1,147,000 bbl. daily. If these rates continue, June will top the previous record of 1,085,000 bbl. daily set in July last year.

Down in Dallas they're spreading the word about the opportunity in exploration. G.S.I. is teaching college students by using top industry men as lecturers, following with oil-patch experience.

Through correspondence courses and field libraries, the company is increasing the knowledge and ability of its own employes. Together, the plans add up to a double-barreled approach to the problem of . . .

How to Find and Keep Oil Explorers

DALLAS. — Geophysical Service, Inc., has come up with an interesting approach to a double-barreled problem:

. . . How to interest the best young college minds in a career of oil exploration.

. . . How to keep them interested and growing in technical ability once they're on the pay roll.

Both problems are common to companies in every corner of the oil industry. The oil industry for the past several years has had to compete with other industries to attract technical graduates into its ranks. The competition doesn't end either when these fledglings are put on the pay roll.

So Geophysical Service's plans are timely and make plenty of sense. The company offers:

. . . A summer tour of work in the field for a select group of 30 college students.

. . . An on-the-job training course in geophysics by correspondence to its employes scattered over the world.

Good old summer time . . . Last week the latest group of G.S.I. collegians scattered over the country to join field exploration crews for the summer.

They had just finished an intensive 4-day orientation program in Dallas. During these 4 days, they got briefed by 44 specialists from eight companies on exploration techniques, equipment, philosophy, management, research, and personnel.

The students listened to and mingled with company presidents, research managers, a board chairman, chief geologists, geophysicists, instrument engineers, and exploration managers.

For the rest of the summer, they will work in rotation in the field with recording, shooting, survey, and drilling units and spend a hitch in the field office. Thus they will get a broad view of the exploration business.

The collegians will be graded by the party chiefs for each week. Their grades will be tabulated weekly in chart form in Dallas. And the performance reports will go to each one of the participating companies and to the colleges and professors of the participating students.

When the summer tour is ended, each student must write a report. It will be graded and also passed on to the professors. The report must be on some topic of the student's own choosing—but cannot be a travelogue. It must discuss exploratory equipment, methods, or something pertinent to his job.

The young men get all this for nothing. They are paid allowances for travel and for meals and hotel accommodations while in Dallas. While working in the field they are paid salaries. They will go back to college this fall with money in their pockets and a more solid understanding of oil exploration and its opportunities, a first-hand view of the high grade of personnel engaged in it—and, the companies hope, an urge to get into the business themselves.

How it started . . . This is the seventh consecutive year for the student cooperative plan.

The first, held in 1951, materialized from a "bull session" between Cecil H. Green, chairman of the board of G.S.I., and Prof. Robert Schrock of M.I.T.

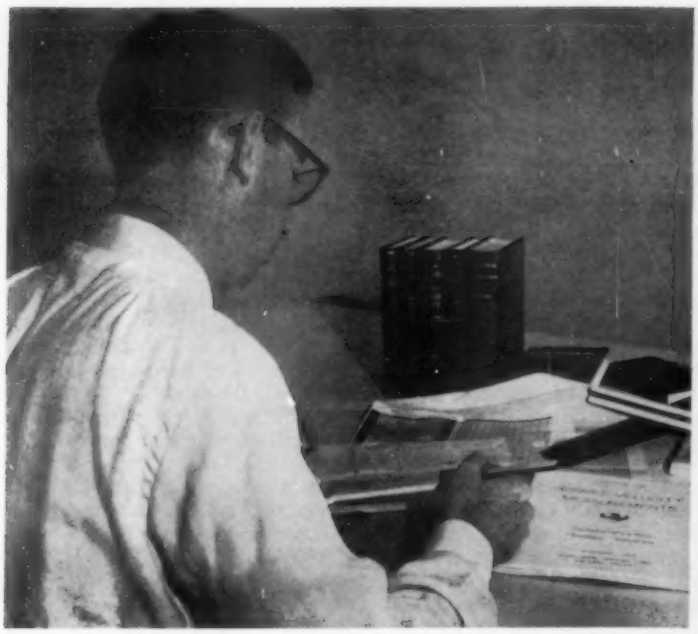
Schrock said he felt it was a shame that students at M.I.T. and other eastern schools had no chance to see or learn anything first hand of the great oil industry. Green agreed.

From this and other talks developed the first session, then called the G.S.I.-M.I.T. conference. Other Dallas oil firms cooperated. The plan went over so big that the sponsors, M.I.T. approving, felt it should be widely expanded to take in students from many other schools.

This year students came from 20 universities in this country and Canada. Professors from seven universities sat in as observers.

Prime mover of the program is Geophysical Service. This firm does most of the planning and coordinating, furnishes a dozen of its top hands as instructors and space for most of the sessions, and foots the travel, food, and hotel bills of the students plus other expenses involved.

Other participants this year are



SCHOLAR IN THE FIELD is Bruce Wentner, geophysical party chief. He is shown at work on a correspondence-course lesson on seismic velocity measurements. The course is one of several offered by his company, Geophysical Service, Inc., to employes.

HIS PORTABLE LIBRARY goes wherever the geophysical field party goes—whether Africa or the Arctic Circle. The library is furnished by the company at a cost of $300.

Magnolia Petroleum Co., Atlantic Refining Co., Seaboard Oil Co., Concho Petroleum Co., California Exploration Co., DeGolyer & MacNaughton, and Texas Instruments, Inc.

All of these companies lent their top exploration people as instructors. Magnolia and Atlantic opened their research labs for organized student tours.

Going over big . . . The program has gained a great deal of stature in its 7 years. Several universities are providing scholastic credit to students who attend.

And each year, more students apply to attend, and more universities ask to be permitted to send students.

This year, G.S.I. got more than 500 student applications — some coming from as far away as Panama, South America, and India. And in a few cases there were a dozen or more from the same school. This leads to quite a culling job.

From the sponsors' standpoint, it's best to have as many schools represented as possible. The sponsors do some screening themselves, but leave most of it up to the college professors. When there are several applications from the same school, they ask the professors to recommend which should be approved.

The program has needed no advertising. The students and professors have proved to be very effective salesmen. Sponsors note that sizable numbers of applications come from those schools which have sent students to previous sessions. And professors pass the word around. G.S.I. often gets calls from schools not before represented asking how they can participate.

What do sponsors get? . . . The participating companies have no call whatever on the student's services after he graduates. If they should want to hire some of them, they compete on an equal footing with such firms as General Electric, Du Pont, and other oil, geophysical, and consulting firms.

What then do they get?

John H. Murrell, Jr., president of DeGolyer & MacNaughton and one of the conference speakers, calls it a kind of "subtle way of advertising for the future."

"We're trying to attract the highest type of student into the oil business. These young people see for the first time the tremendous variety of jobs oil offers them and the top-notch kind of talent it employs.

"Our company stands to benefit from anything that benefits the industry as a whole. Many of these young people are going to take industry jobs. And on the purely selfish side . . . some day soon they'll be in the market for our services."

The student cooperative plan, Murrell points out, is just one of the many things oil industry firms are doing to get more and better people into the business. And they also make friends of people who'll never be in oil.

Officials of G.S.I. and other participating companies expressed similar views: What benefits the industry will benefit the individual firms.

R. C. Dunlap, Jr., manager of G.S.I. domestic operations, figured the plan costs his company something like $5,000 annually in direct expense. That covers costs of the 4-day orientation conference plus minimum training where needed. Along with this the companies lose the time of their participating experts.

Dunlap observed on this point: "The company probably can't justify the program on a dollar and cents basis but we feel it's certainly worth while."

Self-help . . . G.S.I. spends four times more on another program in which its employes voluntarily study to train themselves for better jobs.

It's a correspondence training program which is made available to employes wherever their field party may be located—from the Arctic Circle to Australia. The program has been in effect since 1952. To date more than 300 employes, ranging in grade from junior observer to division manager, have completed courses.

Five courses are offered in the program. They have been described as a practical postgraduate course in

applied geophysics. Currently the subjects covered range from record washing to geology for the geophysicist. Each course has approximately fifteen lessons. Tests are given upon completion of each lesson.

G.S.I. personnel are offered the program on a voluntary basis. It costs them nothing. All supplies and books are furnished. However, the employe must study on his own time. The company spends more than $20,000 annually administering the course. In addition it supplies individual crew libraries valued at over $300 each.

The participant allots whatever time he can to study, but he must complete at least one lesson a month. As the program currently is set up, it takes a minimum of 2 years to complete.

In several cases tardy lessons have been accompanied with a letter explaining that flood waters on the Amazon forced the mail boat to be late, or that the last completed lesson was blown away during a dust storm on the Arabian desert, and it had to be redone.

In setting up the program, G.S.I. management realized the company was going in for education in a rather big way, and the cost would be rather high. But officials felt the payoff in a higher level of technical ability among the personnel would offset the cost.

Other benefits also developed. The training program:

... **Distributes latest information** on geophysical prospecting.

... **Develops a reasonable understanding** of all seismic fundamentals.

... **Allows participants to gain experience** in expressing themselves in writing and may inspire them to write a greater number of technical papers.

... **Reduces supervisor burden** by increasing competence of personnel.

... **Develops top-flight supervisory** and interpretative personnel.

Also G.S.I. has noticed the training program has attracted technical personnel to the company. Another benefit: Those who take the program are less likely to leave the company than those who do not take it. G.S.I. admits these benefits often are rather intangible. But they know of at least one instance where the program was a major factor in an oil company choosing G.S.I. for a contract.

The study program is not a free ticket to advancement for any employe taking it. But those who gain knowledge and skills by the study naturally are able to proceed faster in their jobs.

Texas getting 22,000-footer at:

World's Second Deepest Well

FORT STOCKTON, Tex.—The world's second deepest well will be drilled 13 miles southwest of here by Phillips Petroleum Co. and Sinclair Oil & Gas Co.

The 1 Montgomery "A" is scheduled to go to 22,000 ft. It will be the deepest ever drilled in Texas and only 570 ft. short of the world record set last year by 1L-Humble-L.L.&E. near Port Sulphur, La.

Phillips will be operator on 1 Montgomery. Sinclair owns one-third interest. Location is in Pecos County, 14 miles east of the Puckett area and some 50 miles southwest of the dry hole Gulf Oil Corp. recently abandoned after 940 days of extremely tough drilling. There is no production near the 1 Montgomery location.

The Gulf well, 1 P. G. Northrup, went to 18,771 ft., the deepest in West Texas and second deepest in the state. It was spudded in January 1952. Texas' deepest well is Magnolia Petroleum Co.'s 417-A West Ranch, bottomed dry at 19,060 ft. in August 1955 in Jackson County on the Texas Gulf Coast. Deepest production in Texas is gas from the Ellenburger at about 15,000 ft.

The 1 Montgomery will replace Ohio Oil Co.'s K.C.L.-A. as the world's second deepest well. Ohio abandoned the well at 21,482 ft. as a dry hole. It was spudded in Paloma field, 15 miles southwest of Bakersfield, Calif., in October of 1951 and abandoned 1,175 days later. At that time, it was the world's deepest.

The world's deepest hole was drilled by Richardson & Bass, John W. Mecom, Freeport Sulphur Co., and others. It not only went deeper than any other well but found oil at a record depth—21,443 ft.

Journal Award: **George Weber, left, the Journal's refining editor, receives in New York an Award of Merit made to The Oil and Gas Journal. The award is for "outstanding original research" published during 1956. Presenting the certificate is G. D. Crain, of Industrial Marketing magazine, Chicago, which conducts the editorial contest in which the award was won.**

Huge Salt Dome Found

● Wildcat confirms Pescadito structure near Laredo as big dome. It extends great Southwest Texas salt basin 35 miles west and opens up exciting oil possibilities

LAREDO.—A deep wildcat which so far hasn't found any oil has turned up the most exciting geological information in Texas this year. It proved Webb County's long-recognized Pescadito structure is a deeply seated salt dome.

Pescadito is one of Southwest Texas' largest and most prominent geological features. It covers upwards of 30,000 acres and stretches 9 to 10 miles long and 4 to 5 miles wide. Based on size of the outlined closure it may prove one of the largest known domes.

As a salt dome Pescadito now extends the previously accepted limits of the great Southwest Texas Salt Basin at least 35 to 40 miles westward (see map). It becomes the farthest inland of the nine known or definitely indicated salt domes of the Rio Grande embayment.

The discovery is almost certain to step up oil exploration activities in this entire Southwest Texas region. It heightens an already keen interest in the area because the salt dome structure now raises the possibility of:

. . . **Other domes,** perhaps deep seated and not apparent from the surface, existing in areas where none was believed to exist.

. . . **Huge oil fields** lying buried in sands affected by the disturbance which created the domes.

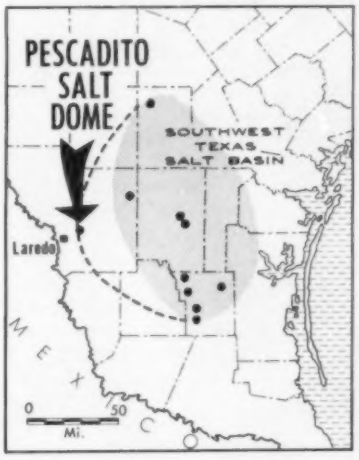
Confirmation that Pescadito is a dome, in addition, gives geologists and geophysicists a better idea of what they're dealing with.

The wildcat . . . Responsible for all this information is the 1 Killam wildcat drilled by Ginther, Warren & Ginther, Houston operators.

It was an interesting well from the start because it originally had as its objective the deep Edwards formation *(The Oil and Gas Journal, February 5, page 217, and March 25, page 287).*

The 1 Killam failed to reach its formational goal but drilled into salt at 15,070 ft. From 14,396 ft. the test had drilled anhydrite, typical caprock material characteristic of most salt domes. The salt mass, penetrated to 15,107 ft., consisted of 70 per cent crystalline salt and 30 per cent anhydrite.

At the 15,107-ft. depth, the test was shut down waiting orders. Original objective in Edwards called for a depth of about 15,500 ft., but state permit for the test was taken out for a depth of 17,500 ft.



Even at its present depth, the test is the deepest ever drilled in this or adjoining counties. Previous deepest test on this structure was drilled by Brewster & Bartle in 1950 to a depth of 13,704 ft.

The Ginther, Warren & Ginther test about a mile south and east of the Brewster & Bartle well, topped the lower Cretaceous-Georgetown lime, the formation overlying its Edwards objective, at 12,900 ft. Through about 1,500-ft. of this formation drilled before the anhydrite was entered, gas shows were logged in fractures. Gas was strong enough to "kick" the 17-lb. mud.

Near-record temperatures were encountered at the bottom of the hole. Last electric log was run from a depth of 14,552 ft. It recorded bottom-hole temperature of 450° F.

The location . . . The Ginther, Warren & Ginther test is near the indicated crest of the structure, about 15 miles east of Laredo.

It is on a lease block obtained by O. W. Killam, pioneer Laredo operator. Specific location is on the large Ortiz ranch, where Killam acquired mineral rights several years ago. This, with the adjoining Manuel Benavides Volpe ranch and other previously-held leases, gives Killam and the present operators virtual control of almost the entire structure.

The structure always had recognizable earmarks of a dome. It is a pronounced domal uplift, ovate in shape. Gravity surveys over the area have indicated it might be a dome.

This has made Pescadito a teaser for exploration men for many years, although no commercial production of any kind has been found. First recorded drilling was started late in 1935, the initial test being abandoned in January 1936 at 3,200 ft. More than 20 scattered tests have been drilled over the years. Except for the Ginther and Brewster & Bartle deep tests, all have quit above 7,000 ft., the majority in the 3,000 to 4,000-ft. range. They have recorded numerous showings of oil and gas, principally in the Wilcox (Tertiary) section in 3,750 to 4,600-ft. zones.

Many different companies and operators have participated in all this drilling. These include Killam, Humble Oil & Refining Co., Seaboard Oil Co. of Delaware, Union Oil Co. of California, in addition to Brewster & Bartle, Gillespie & Sons, and the present operators and their associates.

Actual drilling on the Ginther, Warren & Ginther deep test has been done by Dillard & Waltermire, Houston-headquartered contractors.

Gulf Case Snagged

Supreme Court refuses to hear ratable-take argument

WASHINGTON.—Gulf Oil Corp. will have to go back to Oklahoma courts if it continues its fight against the "take all" order issued by the Oklahoma Corporation Commission a year ago.

That, in effect, was the ruling issued last week by the U. S. Supreme Court. The court refused to accept jurisdiction in the case, which was closed without having been argued and without a written opinion. Justices Frankfurter, Douglas, and Brannan noted, however, that they would have heard arguments before deciding.

The ruling upholds an earlier one by the Federal District Court in Oklahoma City. Both courts held that Gulf had not exhausted its rights in the state courts, rejecting the case on grounds of procedure, not on merit. As a result, constitutionality of the order has not been upheld or rejected.

The case grew out of an order by the Oklahoma commission which would force all common purchasers to take all oil offered them up to the allowable of each lease for the months of July and August of 1956 unless specifically exempted after a hearing before the commission.

Tank-Car Costs Cut

● Phillips may set trend in tank-car construction by eliminating insulation; move will save about $600 per car

TULSA.—A cost-conscious oil industry is going to save millions of dollars by shedding unnecessary insulation from its growing fleet of L.P.G. railroad tank cars.

The Interstate Commerce Commission has already given Phillips Petroleum Co. authority to build new tank cars without insulation. Other companies say it will be just a short time before the special permit is made general.

Phillips has 1,050 new tank cars on order. By not using insulation, the company figures it will save about $600 per car. Net result: A $630,000 saving on construction alone.

To further offset rising railroad freight rates, Phillips is making the new cars larger. They will hold from 11,700 to 14,600 gal., compared with capacities of 10,000 and 11,000 gal. in the old cars.

Phillips has the largest fleet in the oil industry. The new orders will give the company about 5,000 tank cars for hauling propane and anhydrous ammonia. The first of the new cars will come off the assembly line in July.

With the demand for L.P.G. increasing rapidly, it seems likely that other oil companies and tank-car leasing firms will build new uninsulated cars to join the nation's 31,000 high-pressure tank-car fleet.

Phillips lists these other advantages of uninsulated cars:

. . . Lower maintenance costs. For one thing, insulation maintenance will be completely eliminated. And without insulation, it will be easier to repair the tank itself. Corrosion will be cut down since moisture often collects between the tank and the insulation jacket. With less maintenance, there will be less car time lost.

. . . Lighter weight. They'll weigh 8,000 lb. less than the old insulated cars. Gone will be the 4-in. fiberglass insulation around the ⅜-in. steel jacket. Walls of the new tank will be no thicker than the old, but a higher-tensile steel will be used.

The new cars will require a light or white reflective paint. Phillips plans to use a light gray on some of the first new cars released.

How it started . . . As the demand for L.P.G. increased, it was necessary to transport more and more of it a greater distance from sources of supply.

At the same time railroad rates have been increasing. The railroads began pressing for a whopping rate increase last year, as high as 22 per cent in some areas. Part of this rate increase became effective last December, and the remainder is still under consideration.

Some oil men say that L.P.G. suppliers will turn more and more to pipelines if the railroad rates continue to go up. But pipelines don't go everywhere, and railroads do, so the oil industry had good reason to fish around for lower transportation costs.

The less expensive, larger tank car is merely an economic step in the right direction. It started several years ago when L.P.G. companies began asking why railroad tank cars required insulation.

As one L.P.G. traffic man put it: "Everyone thought we were crazy. But we looked around and saw that highway trucks and barges didn't use insulation. Neither did storage tanks. Why tank cars?"

Both Phillips Petroleum and Warren Petroleum Corp., which operates 4,500 railroad tank cars, took a serious look at the situation in 1956. Phillips conducted extensive tests at Borger, Tex., which showed that uninsulated cars would do just as well as the insulated ones.

The principle was endorsed by the Association of American Railroads. Phillips submitted recommendations for filling densities with the A.A.R.'s Bureau of Explosives. A special A.A.R. subcommittee prepared specifications, and the Interstate Commerce Commission gave the green light.

Just how many new tank cars will be built is anybody's guess. But based on Phillips' gigantic order, other companies will be building new, uninsulated, and bigger L.P.G. tank cars.

Texas-Florida Line Started

HOUSTON.—Coastal Transmission Corp. has started construction of a small segment of the 1,500-mile pipeline which will transport natural gas from South Texas to Florida.

Work on a 4-mile section of 8-in. pipe started at mid-June in Hidalgo County, Texas.

Announcement of initial construction was made shortly after Coastal Transmission and Houston Texas Gas & Oil Corp. had completed arrangements for placement of first-mortgage pipeline bonds totaling $103,500,000. This is the first step in financing their combined pipeline system, which will cost about $150,000,000.

Coastal will build 566 miles of the main line from McAllen, Tex., to Baton Rouge. Houston will build the remaining 961 miles to a point near Miami. The main line will have an initial capacity of 250,000,000 cu. ft. daily. It will be 24-in. in diameter.

Refineries Opposed

Issue gets an airing this week before Ontario board

TORONTO.—The fate of two proposed refineries, each with 20,000 bbl. capacity, will be weighed this week in a hearing before the Ontario Municipal Board.

Cities Service Oil Co. and Shell Oil Co. of Canada are seeking permission to build the plants, which have split local residents and officials on the issue of rezoning. The municipal board will make the final decision on the zoning.

Both plants are planned for suburban Bronte on Lake Ontario west of Toronto. They will cost $25,000,000 each and include modern processing facilities to convert Canadian crude to high-quality fuel products.

Cities Service hopes to complete its refinery by January 1959. Shell's schedule calls for later completion, probably in 1960 or 1961. Both companies have purchased sites, Shell 600 acres and Cities Service 300.

The hearing is scheduled for June 24, 25, and 26.

C.A.T.C. to Drill Big Area

HOUSTON.—The C.A.T.C. Group will soon start drilling on a 30,000-acre offshore block originally leased by Gulf Refining Co.

The acreage is about 30 miles off the coast of Cameron Parish, Louisiana. The four-company C.A.T.C. Group has an option to acquire up to 50 per cent interest in the leases *(The Oil and as Journal, May 27, page 103)*.

Tentative location of the first test is in Block 115, East Cameron area. Also included in the acreage are Blocks 103, 104, 105, 114, and 116.

Drilling is expected to start by mid-July. Projected depth of the first test is about 14,000 ft. Continental Oil Co., operator for the C.A.T.C. combine, has applied to the Army Corps of Engineers for authority to erect drilling platforms anywhere on the 30,000 acres. Others in C.A.T.C. are Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.

Railway Is Looking Ahead to Producing Its Fuel From Coal

OMAHA. — Union Pacific Railroad is planning a long-range synthetic-fuels program based on coal. But its future development hinges on changes in the U. S. Mineral Leasing Act.

U. S. Senator Frank E. Barrett of Wyoming focused attention on the plan last week when he announced he is sponsoring a congressional amendment to the leasing act. Present law allows railroads holding mineral leases on public lands to mine coal for use only to fuel their locomotives.

Barrett said he and Sen. Joseph C. O'Mahoney, also of Wyoming, are seeking to remove this restriction. They also have introduced a bill designed to increase the number of acres which may be held in coal leases on public lands.

The railroad's synthetic-fuels plans are being handled by Union Pacific Coal Co., a subsidiary with coal leases in Wyoming. President I. N. Bayless of the coal company last week described the plans as purely long range and depending on outcome of changes in federal laws.

Bayless said the company had independent research and engineering reports on extracting synthetic fuels and chemicals from coal. The railroad would use the fuel in locomotives and market the chemicals. Char left after extraction might be used in generating electric power for Union Pacific's planned development of iron-ore deposits northwest of Cheyenne.

Senator Barrett said the program in Wyoming would involve an investment of between $50 and $150 million. It calls for an extraction plant to be built within 18 months to 2 years. However, Bayless said company planning had not quite advanced that far and that no timetable had been set for either a pilot plant or commercial plant. Further studies on the economics and technology involved will be made if the company gets a green light from Congress, he said.

watching WASHINGTON

. . . with Bertram F. Linz

Import controls in making? . . .

THE Government's effort to secure voluntary control of oil imports is making little headway. President Eisenhower shortly may make some news as a result.

Eisenhower has had a number of meetings with senators and congressmen. He has asked them to put their views and ideas in writing. And he has reportedly assured them that he will act in the near future.

According to reports, two approaches to the problem have been suggested. One, of course, is for a quota. The other is for a tariff to equalize the cost in the U. S. of domestic and imported crude.

The administration has always resisted quotas on imports because of difficulties in handling them and the diplomatic problems they raise. But an effective tariff would have to be so high, some say, that it would scare off much support.

Meanwhile, those senators and congressmen who are loyal to Eisenhower are in a bind. They are reluctant to come out flatly for any particular method of import control for fear that it might put them in opposition to the President. So everyone is waiting for the White House to make the first move, hoping it will make it soon.

Road to gas bill still bumpy . . .

THE Harris gas bill now is expected to reach the House floor for vote before the end of July.

Since there is no chance of the Senate taking the measure up this session, timing is not too important. But supporters want to get the bill through the more politically sensitive House this year. The fact that next year brings congressional elections will be less important in the Senate, where the terms of only a third of the members will end in 1958.

The House commerce committee started closed-door talks on the bill last week. Much of the heat has been taken out of the issue by the withdrawal of the administration's demands for changes. But there still remains a number of areas of dispute.

Backers of the bill say that its chances for committee approval have been increased greatly by President Eisenhower's latest plea for action this year.

They say the two-vote margin which they counted for the measure a few weeks ago has been increased. But they don't claim that it will be a simple job to write a bill on which a good majority of the committee can agree.

Trial by investigation . . .

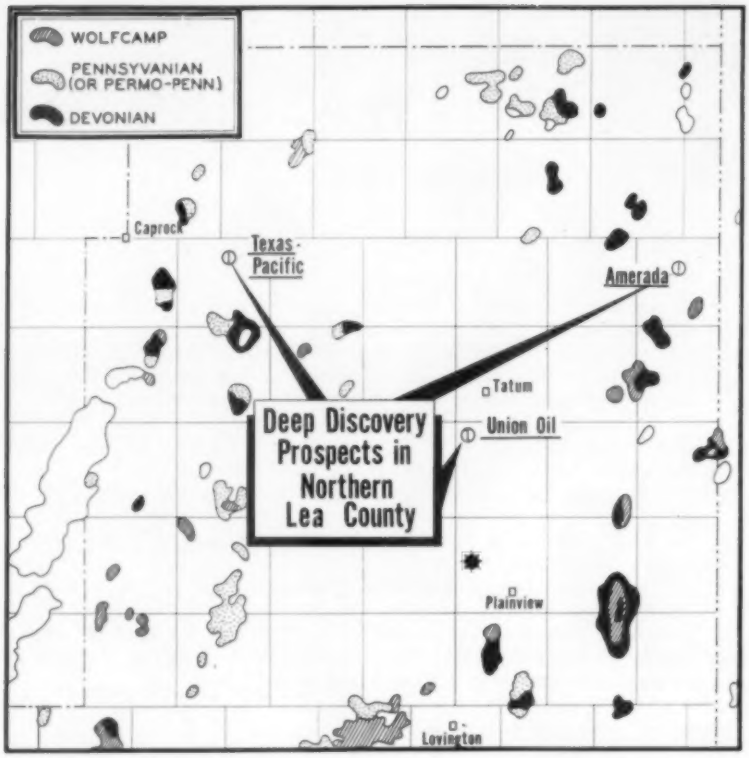
SEN. O'MAHONEY'S formal report on his oil probe will not cover the whole area outlined in the staff reports aired a couple of weeks ago.

It will be more of an indictment of the industry. The trial will be held next year in the shape of the all-out investigation of oil which O'Mahoney has long wanted to make.

The report itself will be something of an anticlimax. But the Wyoming senator accomplished his purpose. The "evils" of the industry have been laid on the table for all to see. That this was the aim was evident in the way the act was staged.

O'Mahoney's findings are likely to be limited to matters on which his joint subcommittee took testimony. The European oil lift and last January's price increases, the original subjects of inquiry, will be covered. Depletion on foreign production, Arabian American Oil Co.'s contract with Saudi Arabia, and pipeline ownership probably will be discussed.

But many of the charges made in the staff reports were not probed during the hearings. The staff itself said that some of them would stand further study. The recital merely set up targets for a future investigation.



New Mexico Play May Spread

HOBBS.—Northern Lea County's unnamed basin is proving to be a deep but successful hunting ground for oil finders.

Last week three wildcats were showing for discovery wells. Their success could mean a lot of new drilling. The New Mexico basin, roughly the area shown on the map, has not yet been defined by the drill.

The three prospects are Texas Pacific Coal & Oil Co. 1 Collier, on the west side, Amerada Petroleum Corp. 1 "EC" State, on the eastern side, and Union Oil Co. 1 Duncan, near the center of the basin.

If the Union strike is completed as a good commercial producer it would indicate that production extends across the deeper central portion of the basin and would label the whole area as prime oil-hunting territory.

Depth of the basin beds (10,000 ft. just to the Permian-Wolfcamp) puts it in a cost class for majors only, but a number of pay chances on the way down to the Devonian at 12,000 to 13,500 ft. eases the financial risk.

Devonian target . . . Operators looking for deep oil in southeastern New Mexico head for the Devonian rocks.

The Devonian fields (dark shaded areas on map) show they have enjoyed above-average success, especially along the eastern border of Lea County. Many of these pools are on north-south trending folds, have structures of high relief, good porosity, and have produced wells with upwards of 2,500 bbl. per day initial potentials.

Further drilling inducement is offerred by the state's proration formula, which contains a depth factor. Also, some wells in Denton field, on the south end of the trend, have more than 500 ft. of pay, while Cross Roads field, at the northern extreme, has recovered over 9,000 bbl. of oil per acre.

This all makes for a rosy picture of Devonian prospecting. It doesn't always pan out that way, but operators have another chance for production in the Permo-Pennsylvanian. This is the intermediate, or transition, zone between sediments of Permian and Pennsylvanian age.

It is the big secondary payoff objective, not only for Lea County's basin, but for the entire Permian basin, of which Lea County is also a part.

General practice when drilling a Devonian test is to drill-stem test all oil shows while drilling. Then if the Devonian is found dry, production tests are started back up the hole. Many of the Permo-Pennsylvanian fields on the map have been opened in that fashion.

The Permo-Penn . . . Unlike fields in southern Lea and Eddy counties, there is little reefing in the basin above.

Permo-Pennsylvanian oil source beds often consist of limestones and dolomites, with average good porosity and wells of fairly high initial potential. Operators report good seismic returns, and locations usually are based on subsurface control. Fields having Permo-Pennsylvanian production are dotted on the map.

Operators in the Lea County basin are optimistic when they talk of finding additional fields, and they're quick to point out that each exploratory well has more than one objective.

The three wildcats now showing for new-field discoveries are:

. . . Amerada's 1 "EC" State. This well flowed 370 bbl. of 48°-gravity oil in 14 hours through various chokes. Production was from Devonian perforations at 12,021-96 ft. Total depth was 12,120 ft. Maximum flowing pressure was 3,550 psi.

. . . Union's 1 Duncan. This is a scheduled 15,000-ft. wildcat 3 miles southwest of Tatum. It flowed oil at the rate of 15 to 20 bbl. an hour during part of a drill-stem test in Permo-Pennsylvanian at 10,282-10,360 ft. Total depth at last report was 10,554 ft.

. . . Texas Pacific's 1 Collier. This is a 12,000-ft. wildcat 8 miles southeast of Caprock. It flowed 52°-gravity oil at a rate of 30 bbl. an hour on a drill-stem test of the Permo-Pennsylvanian at 10,010-10,116 ft. Gas volume was at the rate of 2,000 M.c.f. per day. Maximum flowing pressure was 1,215 psi. The operator was drilling ahead after the test.

McRae Buys Utah Firm

MIDLAND, Tex.—McRae Oil & Gas Corp., Midland, has acquired Paradox Oil & Gas Co., Salt Lake City, through an exchange of stock. Paradox will get McRae stock valued at about $500,000.

McRae will take over about 51,000 acres of former Paradox leases in central and eastern Utah. The company has a contract with Gulf Oil Corp. whereby Gulf will drill on 1,920 acres of this land. Gulf will assume all expenses in exchange for a half interest in the mineral rights.

McRae production currently is running about 1,600 bbl. daily of oil and 6,000,000 cu. ft. a day of gas from 112 wells.

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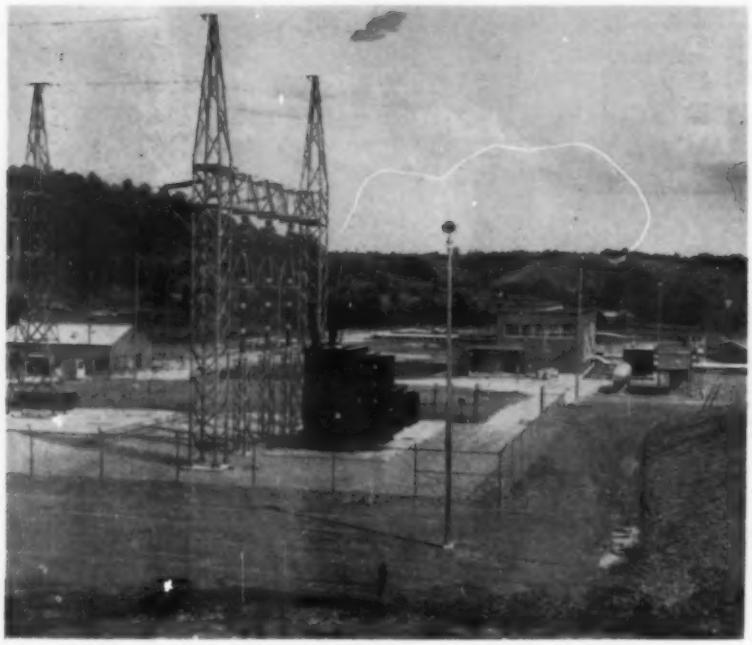


Texas Eastern unveils new setup. It's a . . .

Station With Advantages

MOUNT PLEASANT, Tenn.—A new electrically driven centrifugal compressor station unveiled here last week by Texas Eastern Transmission Corp. is making some sort of pipeline history.

Two major advantages make the installation a standout: It has the lowest investment cost per horsepower in the industry. Its low operating cost is unusual.

The station here is one of three of the same type operating on Texas Eastern's 775-mile, 30-in. trunk line from Kosciusko, Miss., to Uniontown, Pa. But unusual features of the station were revealed for the first time last week. These include:

. . . **Single power unit.** The station is powered by one 15,000-hp. Westinghouse electric motor—by far the largest ever built for a pipeline. It is a synchronous motor rather than an induction motor, which is another departure.

. . . **New starting system.** The motor has "across the line" starting which means it starts under full load rather than reduced voltage. This feature greatly simplified switchgear installation and saved $75,000 in original investment.

. . . **Low investment.** The station was built at a cost of $1,710,530 or $114.04 per installed horsepower. This is less than half the investment tied up in some stations now operating and compares with $168.50 per horsepower for Texas Eastern's Gladeville, Tenn., station. The Gladeville station is powered by six 2,500-hp. electric motors and is itself a modern, efficient station.

. . . **High compression ratio.** The motor drives a single-stage centrifugal compressor manufactured by De Laval Steam Turbine Co. The compressor was handling 680,000,000 cu. ft. daily last week. The compression ratio of 1.5:1 is the highest ever achieved in a single-stage centrifugal. The compressor does as much work as six units at another station.

Surge control . . . A newly developed surge protection system also is being tested at the Mount Pleasant station.

This Texas Eastern innovation protects equipment and piping against undesirable vibrations caused by surges developed in centrifugal compressors.

An electronic device senses the approach of a surge by detecting the critical frequencies known to precede it. This device located on the discharge side of the station automatically opens recycle bypass lines, and the mass flow through the compressor is increased. Conditions are changed and the developing surge does not materialize.

A second type of surge protection also is being tried at another Texas Eastern station. This scheme consists of pressure-differential detection across the station discharge check valve. The cure, after the surge signals are detected, is much the same as in the first system.

New departures . . . The latest in electric motors and compressors for pipelines was put on display during a tour conducted by Baxter D. Goodrich, vice president and chief engineer of Texas Eastern.

It began in Shreveport with a meeting at which Orville S. Carpenter, president of Texas Eastern, was host. Key engineering and operating personnel accompanied trade journalists to explain the outstanding features of four stations visited in Tennessee, Ohio, and Pennsylvania.

The new single-unit station, by far the largest of its kind, represents a radical departure in design in many ways. It is a new approach to the situation and required the hurdling of a major obstacle—the reluctance to rely on one unit to provide power for a big main-line station. If this unit is shut down, the station is off the line. There can be no standby for a unit of this size and cost.

Station development . . . Goodrich, who conceived the station 6 years ago, took his idea for a big motor to various manufacturers in 1951. Three years later bids were received, and Texas Eastern ordered a motor five times as large as any other operating on a main line.

It was installed a year ago. There were the usual troubles common to a pioneering venture. But performance has justified Texas Eastern's faith in the big single unit. It's particularly suited to locations where plenty of low cost power is available and where the unit can be utilized to the fullest the year round.

Being simple, with push button starting and shutdown, the station lends itself to possible future remote operation. Only one operator per tour is needed now.

Gas turbines . . . Gas turbines were inspected at Athens, Ohio, and Grantville, Pa., stations.

The turbine-driven units perform a different but equally important role in the system. They are outstanding for their flexibility and for the fact they reach peak operating efficiency when its needed most—in coldest weather.

Texas Eastern will have nine turbine stations with 15,000 hp. each when its current expansion program has been completed.

Tideland Ruling Due

Supreme Court may act soon in Louisiana case

WASHINGTON.—A critical decision, vitally affecting the rights of the gulf states to the submerged resources of their offshore waters, may be announced this week by the U. S. Supreme Court.

Only Louisiana's seaward boundary is involved now. But the court's ruling on that question also will affect Texas and Florida, which also claim 3-league boundaries in Gulf of Mexico.

The primary issue before the court is whether Louisiana's boundary is 3 miles or 3 leagues from the low-water line. The court, however, need not rule on that point now. It could, instead, order a full-dress presentation of the case, either before it or before a Louisiana court.

The court is trying to clean up its docket prior to recessing for the summer. Barring some obstacle, it will wind up its term this week. If a decision in the Louisiana case is not rendered now it will be delayed until the court's next term, in October.

Leasing delayed . . . So long as the case is in the courts, further federal leasing of the Continental Shelf off Louisiana is expected to be held up. Even though an agreement was reached last year permitting the leasing of certain areas, no new sales have been scheduled.

The Interior Department twice this year has brought up the idea of selling leases in those areas now available to it for disposition. But it is reported to have dropped its plans because of the lack of interest by oil companies.

Gas-Line Project Gets Nod

SHREVEPORT, La.—Texas Eastern Transmission Corp. has authority to go ahead with its $30,300,000 expansion program, which will boost its pipeline capacity by 110,000 M.c.f. of natural gas daily.

The Federal Power Commission has approved the company's plans to add 67,610 hp. to compressor stations, and 136½ miles of new pipeline.

The company will spend $25,900,000 for the following projects: a new 10,250-hp. compressor station; 33,360 additional horsepower for seven existing stations; 96.5 miles of 30-in. line along the existing Mississippi-Pennsylvania line; and 40 miles of laterals.

A wholly owned subsidiary, Penn-Jersey Transmission Corp., will add 24,000 hp. to five compressor stations at a cost of $4,400,000.

Pipeline briefs

General Petroleum Corp. has contracted for more than 5 billion cubic feet of natural gas as supplemental fuel for its 37,000-bbl. refinery at Ferndale, Wash. G.P. signed a 5-year contract with Cascade Natural Gas Corp., which is scheduled to start deliveries August 1.

Cascade is building a 15-mile pipeline to move the gas. The line will connect the refinery with Pacific Northwest Pipeline Corp.'s main line. Use of the supplemental gas by the refinery will make additional supplies of L.P.G. and fuel oils available to Pacific Northwest markets.

Texaco-Cities Service Pipe Line Co. has awarded a contract for 98 miles of its 170-mile, 6-in. L.P.G. line from East Chicago, Ind., to Lowell, Mich., to Somerville Construction Co. Somerville will build the section from South Bend, Ind., to Lowell. Completion is scheduled September 1. The 8,000-bbl. daily line will make deliveries in the Griffith, South Bend, Ind., and Grand Rapids areas, starting late this summer.

Lane field in Lea County, New Mexico, has been connected to the Texas New Mexico Pipe Line Co. system. The new 3-in. outlet means an end to trucking of crude from the new field. Sunray Mid-Continent Oil Co., one of the producers in Lane field, will operate the gathering system.

Westspur Pipe Line Co. is looping most of its 110-mile, 12-in. line with 16-in. pipe this summer, reflecting the rapid development of the southeastern Saskatchewan area it serves. The original line, with 60,000-bbl. daily capacity, extends from Midale field, through several others, to the Interprovincial pipeline serving U. S. and eastern Canada markets.

The company has let contract for 75 miles of 16-in. loop between the Steelman, Sask., terminal, and Cromer, Man., at the Interprovincial tie-in, to Gragg (Canada), Ltd., affiliate of an Oklahoma City contractor. Majestic Contractors, Ltd., is laying 20 miles of 12-in. from Alida to connect Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields. The entire project is to be finished by August 1.

Gibson Crude Oil Co.'s 19-mile crude line from Bellshill Lake field in northeastern Alberta to Interprovincial pipeline's pump station near Hardisty will start moving crude this month. Initial throughput will be 2,500 bbl. daily. The line has a capacity of 15,000 bbl.

East Ohio Gas Co. is adding 90 miles of 24-in. and 23 miles of 30-in. to increase deliveries through its natural-gas system in Ohio. The new lines are between Richfield and Summerfield, Ohio. Sharman, Allen, Gay & Taylor, Inc., has the contract for the job. It's scheduled to wind up in November.

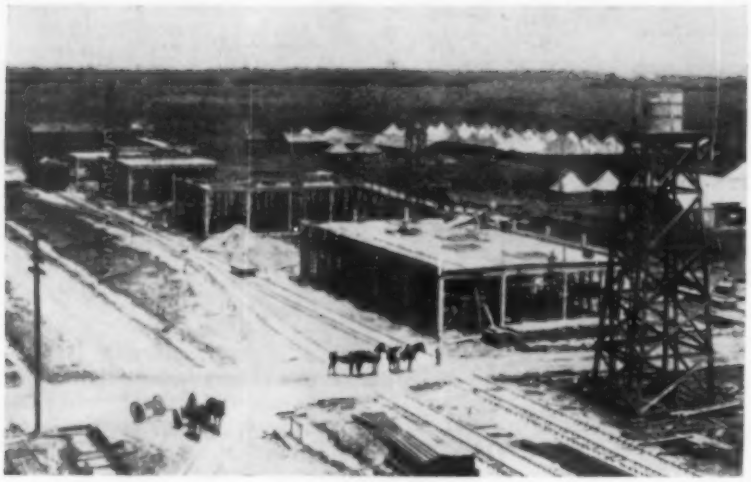
Manufacturers Light & Heat Co. is laying 60 miles of gas line from Corning to Dundee, N. Y., and 50 miles from Waynesburg, Pa., to Pittsburgh. The New York line includes 20 miles of 16-in. and 20 miles of 6 to 12-in. The Pennsylvania line is 10 and 12-in. All of the work is contracted to Harford Bros., Emporium, Pa.

Cities Service Gas Co. plans to build a 75-mile, 30-in. line along its main line through Kansas this fall. The loop will be located between Independence and Welda. A permit is being sought from the Federal Power Commission. Pipe delivery is scheduled to start in October and November.

Also for Pipeliners . . .

Lack of pipeline connections is given by some Mid-Continent operators as one reason drilling operations are down (P. 97) . . . Gulf Oil has lost another round of its fight with Oklahoma Corporation Commission against the "take all" lease order (P. 105) . . . Work has started on the Texas-to-Florida gas line (P. 106) . . . Texas Eastern Transmission has unveiled an unusual electrically driven centrifugal compressor station (P. 110) . . . Transcontinental Gas Pipeline is starting a major expansion program to boost its capacity above one billion cubic feet daily (P. 114).

PLUS THESE TECHNICAL FEATURES: How supercharging of two-cycle engines can boost horsepower with small cash outlay at compressor stations (P. 160) . . . and Pipeline Patrol's construction report (P. 183).



Mushrooming from this small start . . .

Baytown plant now a modern giant as . . .

Humble Reaches 40th Birthday

HOUSTON.—Humble was the right word for it when Humble Oil & Refining Co. came into corporate existence 40 years ago this month.

Unlike many of today's majors, though, Humble started out as an integrated company.

It had a refinery, now described as a "washpot," which produced 300 gal. of gasoline a day. Its entire crude supply came from a single well.

It had what might pass as a marketing division, with equipment consisting primarily of a Model T Ford truck. The vehicle hauled each day's production from the refinery at Humble, Tex., to nearby Houston where it was sold through "filling stations."

From the beginning, Humble also could boast of a pipeline. The "system," some 3 miles long, gathered oil from Goose Creek field.

Then, as now, Humble was heavy on the production end. It started in business with a net daily production of something like 8,800 bbl. of crude. In 1918—the year after receiving its charter—Humble already had become the third largest oil producer in Texas.

How it started . . . Humble Oil & Refining Co. came into existence—officially—on June 21, 1917. That's the day it received its charter to do business.

The company actually traces its operations back to March 1, 1917. Already holding properties valued at $8,000,000, the organization was held together by verbal agreements for several months while awaiting its charter.

The present organization took its name from the old Humble Oil Co., which had been organized by Ross S. Sterling, Frank P. Sterling, and Miss Florence Sterling.

First board of directors under the Humble charter included R. S. and Frank P. Sterling, W. S. Farish (later chairman of the board of Jersey Standard), R. L. Blaffer, H. C. Wiess, C. B. Goddard, L. A. Carlton, W. W. Fondren, and Jesse Jones. Jones, a financial wizard, left the board a few months later, reportedly because he didn't think the company had much future.

By the end of 1919 Humble had started work on its Baytown, Tex., refinery. When the plant went on stream in 1920 it had a rated capacity of 10,000 bbl. Five years later the capacity had been boosted to 50,000 bbl. daily. Today it is 282,000 bbl.

Humble Pipe Line Co. was established before the refinery was completed. Starting with 50 miles of pipeline in Goose Creek and Burkburnett fields, the subsidiary now has a system 9,200 miles long.

Standard of New Jersey bought 50 per cent of stock in Humble in 1919. Today it owns about 87 per cent interest in the affiliated company.

Production champ . . . In 1925 Humble was the second largest oil producer east of the Rockies. Since 1943 the company has been America's largest producer of domestic crude oil. Its crude production last year reached a new high of 371,000 bbl. daily.

Since 1951 Humble has been the leading marketer of gasoline in Texas.

During its first 40 years the company has extended its exploration activities from Texas as far east as Florida and westward to California. Soon it will start drilling in Alaska.

Yet there is something typically Texan about the company. By any other standards it couldn't call itself "humble."

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Transco Expanding

Starts work to push peak-day capacity past billion cubic feet; key is 247 miles of line to tap new Texas reserves

HOUSTON.—A major expansion program which was started last week by Transcontinental Gas Pipe Line Corp., will boost the company's peak-day gas deliveries to more than 1 billion cubic feet.

Key to the increased capacity will be 247 miles of pipeline laterals which will tap large shut-in gas reserves in three southwest Texas counties.

Work on the project started immediately after a June 12 order of the Federal Power Commission approved the major portion of construction costing an estimated $54,000,000.

The temporary certificate also authorizes construction of 57 miles of 30 and 36-in. main-line loops in Louisiana, Mississippi, Alabama, Georgia, and South Carolina, and other facilities to boost next winter's gas deliveries.

Also included in the new project are three new compressor stations on Transco's main line, higher compression horsepower at several existing stations, and eight dehydration installations for new production in Texas.

The new facilities are needed, Transco explained, to step up its daily allocations to the New York-New Jersey-Philadelphia metropolitan area by more than 83,000,000 cu. ft.

Whopping deliveries . . . By the end of the year, Transco expects to be delivering approximately 970,000,000 cu. ft. per day through its pipeline system.

With addition of gas from storage near its eastern marketing area, the company's peak-day capacity next winter will total about 1,106,000,000 cu. ft.

Last year, the company's daily allocation—including storage gas—totaled about 890,000,000 cu. ft. per day for an all-time high.

Taps new area . . . Lateral lines, mostly of 24 and 16-in. diameter, will extend westward from the main-line compressor station near El Campo, Tex., to presently shut-in fields in Frio, McMullen, and La Salle counties.

E. Clyde McGraw, Transco president, said the company has "large new reserves" committed to it in this area, which is not now served by any big-inch transmission line.

"Not only are the estimated reserves large," the company announced, "but the new pipeline outlet for natural gas in these fields south of San Antonio has already stimulated extensive additional exploration in three counties."

Transco will pay 13.5 to 14 cents per M.c.f. for gas in the three-county area. Because most of the area has been sparsely drilled, company officials were unable to predict the volume of new reserves dedicated to Transco.

Bigger things ahead . . . McGraw said that company expenditures for construction and materials in 1957 will total more than $100,000,000. The 1958 program, he said, probably will be even larger. Already the company has made concrete plans for further expansion in 1959 and 1960.

In addition to the new facilities, a $51,000,000 construction program started by Transco last fall is now more than one-half completed. This includes addition of main-line loops of large-diameter pipe.

By mid-July, McGraw said, a new lateral will be completed to Block 45 off the coast of Cameron Parish, Louisiana. Through this line, Transco will transport gas bought from Mecom Petroleums, San Jacinto Petroleum Corp., and others.

McGraw also revealed last week that Transco is now buying gas for the first time from fields in Mississippi. The company recently signed contracts with several purchasers near Laurel, Miss.

In addition to its main marketing area in the East, Transco also serves the Piedmont area of the South. Two new customers will build transmission lines to supply gas from Transco to cities in the tidewater areas of North and South Carolina.

Recovery outlook good:

Pan Am Plans Big Flood

AUSTIN.—Pan American Petroleum Corp. may net an estimated 25,000,000 bbl. of added oil at West Willamar field in extreme South Texas, if its proposed pilot water flood pans out.

The company has asked the Texas Railroad Commission for a permit to start a small pilot flood in the West Willamar unit of Willacy County, about 25 miles from the Mexican border.

If the program proves out, the project will be expanded to a peripheral field-wide flood. Pan Am will start the pilot by injecting water through two inputs into the 7,925-ft. Willamar (upper Frio) sand.

The 7,000-acre field was discovered in March 1941 and is believed to be in the middle stage of depletion. Since 1951, Pan Am and Humble Oil & Refining Co. have been injecting gas in a cooperative program.

The two companies had injected more than 42 billion cubic feet of gas through January of this year. Pan Am believes that the gas injection has hiked West unit production during this period by 2,500,000 bbl.

The operators are still injecting 25,000 to 30,000 M.c.f. of gas a day from the West and East reservoirs and the graben area. But gas-oil ratios in the solution-gas-drive field are climbing rapidly, and Pan Am feels

the program has about served its purpose.

Ratios have increased from an average of about 5,000:1 in 1950 to about 7,500:1 in 1956. However, bottom-hole pressure has been held steady at 2,300 to 2,400 psi. since 1952.

There are now about 168 producing wells in the project area, averaging about 25 bbl. daily output each. This area has produced about 25,000,000 bbl. to March 1, 1957. Pan Am figures the reservoir held about 175,000,000 bbl. of oil initially.

The company estimates oil saturation at present at about 63 per cent and thinks water flooding will cut this to about 45 per cent at abandonment.

Flood plans . . . Pan Am plans to convert Willamar West unit wells Nos. 118 and 123 to inputs as soon as the Texas Railroad Commission approves the project.

Injection water will come from a salt-water sand at 2,572 ft. Injection will be through a closed system at a rate of 2,500 bbl. daily per well. Surface injection pressure will be about 2,000 psi.

Some gas will continue to be injected to keep the field's gas cap from shrinking and to prevent loss of oil into the gas cap area.

At long last:

Ancient Field Set For Deep Drilling

CANON CITY, Colo.—After more than 80 years, the drill is going to find out whether there is any oil below the shallow producing formation of the second field discovered in the United States.

Mile High Oil Co. of Denver is planning a deep test this summer in Florence-Canon City field, where the granddaddy of all commercially active wells is located. The company said only that it will go deeper than anybody has gone in the old field.

Florence was discovered in 1876, the year Colorado became a state. Since then it has produced in the neighborhood of 15,000,000 bbl. of oil, mostly from Pierre shale of the Upper Cretaceous at around 1,200 ft. Production depths range to around 1,500 ft.

The field's oldest well came in nearly 70 years ago and has a production record of over 1,000,000 bbl. It is still good for about 6 bbl. a day.

Florence was discovered almost by accident. A test well had brought in oil nearby in 1862, only 3 years after Drake had drilled the nation's first successful oil well at Titusville, Pa.

The first test in the Florence area was drilled on Oil Creek near the site of oil seeps. While it apparently was not commercial, results were promising enough to draw the attention of Isaac Canfield, who had worked with Drake at his famous discovery.

Canfield selected the location for his pool opener because the terrain resembled that at Titusville.

Until 1902, Florence was Colorado's only producing field. It later became Florence-Canon City field after the two areas were joined. Other firms with interests in the area are Continental Oil Co., Pure Oil Co., and British American Oil Co., Ltd.

Processing briefs

British American Oil Co., Ltd. broke ground last week for its 20,000-bbl. refinery at Port Moody near Vancouver, B. C. The new high-octane plant will include atmospheric and vacuum crude distillation, Orthoflow catalytic cracking, Catforming, alkylation, and hydrogen treating.

When completed late next year, the plant will boost British American refining capacity in Canada to nearly 100,000 bbl. daily. The company's five other plants are in Montreal; Clarkson, Ont.; Moose Jaw, Sask.; and Calgary and Edmonton, Alta.

The refinery will be built by Canadian Kellogg Co., Ltd. British American President M. S. Beringer pointed out that the new plant will have a capacity exceeding Alberta's crude-oil production a decade ago. Refining capacity on Canada's West Coast has increased steadily since Alberta's Leduc discovery in 1948.

Hearings will begin in New York about July 11 on applications of several companies to withdraw their opposition to the sale of Universal Oil Products Co. stock by Guaranty Trust Co. Louis M. Loeb, president of the Bar Association of the City of New York and recently appointed referee in the U.O.P. sale, said if amicable agreement is not reached, Guaranty's petition to dispose of the U.O.P. stock will be heard in open court early in October.

Champlin Oil & Refining Co. will add a 1,430-bbl. hydrofluoric acid alkylation unit at its 31,000-bbl. Enid, Okla., refinery. The plant, to cost about $1.9 million, will license the Phillips Petroleum Co. process. It should be on stream by March 1958. Badger Manufacturing Co. of Cambridge, Mass., will build it.

A million-dollar natural-gas plant will be built at Big Springs field in southwestern Nebraska by Kansas-Nebraska Gas Co., Inc., Phillipsburg, Kans. The plant will process 35,000 M.c.f. of gas daily, and will turn out 25,000 gal. of propane, 8,000 gal. of butane, and 6,000 gal. of natural gasoline daily. Plant site will be at the firm's Big Springs compressor station.

Caltex has three new units on stream at its Pernis refinery in The Netherlands. The 7,500-bbl. U.O.P. Platforming unit is producing high-octane gasoline from Arabian crude. One of the two new U.O.P. Unifining units, with a 7,500-bbl. capacity, will treat either Arabian straightrun naphtha or a blend of straightrun and thermally cracked naphthas. The other will handle a 4,500-bbl. charge of either virgin gas oil or a blend of virgin gas oil and catalytically or thermally cracked gas oil.

Two chapters of the Guide for Inspection of Refinery Equipment is now available from the Division of Refining, American Petroleum Institute. They are Chapter 2, which deals with conditions causing deterioration or failures, and Chapter 13, which deals with inspection of atmospheric and low-pressure storage tanks.

Also for Refiners . . .

Unless drilling picks up the domestic industry could wind up 1957 by adding less oil to reserves than it produced (P. 97) . . . Phillips may be setting a trend in tank-car construction by eliminating the insulation at a saving of $600 per car (P. 106) . . . Ontario Municipal Board will decide the fight in Toronto over two proposed refineries by Cities Service and Shell for a suburban area (P. 106) . . . Humble, now 40 years old, started out as an integrated company with a "washpot" refinery (P. 112) . . . Sinclair has started something new in refining: It has increased its products prices to offset increased wage costs. The added costs resulted from 2-year contract signed with O.C.A.W. for 6 per cent pay boosts (P. 116) . . . Kerr-McGee is planning a shop-'n-gas program by turning supermarket parking lots into portable service stations (P. 118).

PLUS THESE TECHNICAL FEATURES: Why more companies are farming out plant maintenance to contractors (P. 123) . . . New methods cut time, expense, and danger of chemically cleaning storage tanks (P. 126) . . . The Journal surveys contract maintenance at nation's refineries (P. 128) . . . How to keep cooling towers at top efficiency (P. 130) . . . Circulation cleaning with detergents saves big money (P. 136) . . . Refinery construction survey (P. 172) . . . COST-imating (P. 174) . . . and Refiner's Notebook (P. 176).

Sinclair, Union Agree

Only nation-wide labor contract calls for 6 per cent wage hike, more benefits; new contract will run for 2 years

DENVER.—Organized labor has cleared the last major hurdle in its 1957 wage negotiations by settling with Sinclair Oil Corp. for a 6 per cent wage increase and "substantial" fringe benefits.

The contract between Sinclair and the powerful Oil, Chemical, and Atomic Workers International Union, is labor's choicest, involving 10,000 workers. It's the union's only nation-wide contract.

To help cut negotiation costs, Sinclair and the O.C.A.W. decided on a 2-year contract, instead of the customary 1-year. But the new pact includes a clause whereby wage talks can be resumed after 1 year. The workers are now ratifying the contract.

This will be one of the first 2-year contracts for O.C.A.W. in the oil industry, although there are a number of 2-year contracts between O.C.A.W. and the chemical industry.

Cities Service Co. has also agreed to 2-year contracts for at least a dozen O.C.A.W. units in the Mid-Continent area and the East Chicago, Ind., refinery. These contracts, also calling for a 6 per cent wage increase, await only formal ratification by the workers.

Sinclair's pact . . . Sinclair's agreement follows closely the national pattern set by other companies last month *(The Oil and Gas Journal, May 27, page 98)*. This includes 6 per cent retroactive to May 1; 5 per cent retroactive to April 1; 4 weeks vacation after 20 years; and double time and a half for 8 hours of holiday work.

In addition, the agreement allows for double time for all holiday work beyond the regularly scheduled 8-hour tour, and "substantial" improvements in hospital and surgical plans.

Sinclair workers already had eight paid holidays, so this point was not included in negotiations, as was the case in most other O.C.A.W. dealings this year.

Both the wage contract and the benefit plans will expire June 15, 1959. The benefit plans were previously under a 5-year contract with no reopening clauses.

The negotiations had been under way in Kansas City, Mo., since May 21—for nearly 4 weeks. The old contract expired less than 24 hours after final agreement on the new one was reached.

Conflict on dates . . . A union source said the Sinclair negotiations almost broke down over retroactive date of the wage increase, but the breach was apparently patched up in time.

A few other negotiations did not fare so well when a dispute arose over retroactivity. Five Standard Oil Co. (Ohio) plants with 137,000-bbl. total capacity were shut down earlier this month because of disagreement over effective date of the wage hike.

O.C.A.W. workers struck at the Cleveland, Lima, and Toledo, Ohio, plants, and the Covington, Ky., refinery *(The Oil and Gas Journal, June 17, page 97)*.

Retroactive date also stymied negotiations for Socony Mobil Oil Co. workers at the East St. Louis, Ill., refinery. Two other plants still remain closed because of earlier strikes. At Crown Central Petroleum Corp.'s Houston plant, 300 workers were idle, and at Pure Oil Co.'s Lemont, Ill., refinery, 350 were off work.

Wages Hike Prices

Sinclair blames product increase on higher costs

SINCLAIR REFINING CO. broke new ground for the oil industry last week. It raised product prices, giving as the reason increased costs stemming from wage boosts just granted its workers.

This is a fresh approach to product pricing for the oil industry. Other industries—notably steel—consistently pass along costs of wage increases to their customers. Oil producing companies, however, traditionally absorb the higher costs and relate product prices to seasonal requirements.

Sinclair raised its wholesale prices on gasoline, kerosine, and distillate fuels by 0.2 cent a gallon and residual fuels by 5 cents a barrel. The increase will be reflected in retail levels throughout the company's 36-state marketing area.

A company explanation said since 1946 the oil industry had absorbed an 83½ per cent increase in straight-time wage rates. This was achieved through more efficient operations. But Sinclair said this time the costs of a 6 per cent wage boost could not be absorbed through efficiency and must be recovered by higher product prices.

Standard Oil Co. of California followed Sinclair's move to relate prices to costs. It increased prices by 0.3 cent a gallon on gasoline, middle distillates and related products — even solvents. Lube oil went up 2 cents a gallon and heavy fuels 5 cents a barrel. It markets in seven western states, Alaska, and Hawaii.

Continental Oil Co. also joined the move. Conoco raised gasoline prices generally 0.2 cent with 0.3 cent more in a few areas. The increase on residual was 5 cents a barrel.

Other major companies reportedly are studying Sinclair's action but have made no move. The Sinclair increase runs counter to prevailing price trends in the market and whether the boosts will stick is a big question. Prices for middle distillates and even gasoline have been soft on both the East and Gulf coasts for several weeks.

The Oil, Chemical and Atomic Workers International Union, however, lost no time in assailing Sinclair's price increase. O.C.A.W. representatives negotiated the 2-year contract with Sinclair which resulted in the 6 per cent wage increase.

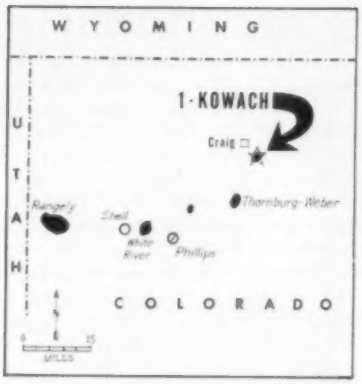
O.C.A.W. Vice President B. J. Schafer called the price increase unnecessary. He estimated the new labor contract will cost Sinclair about $9 million annually and the price increases will boost the company's income by more than $13 million.

Sun Hits Deep Production

AMARILLO.—The deepest Morrow production ever found was reported last week at a Sun Oil Co. wildcat in northeastern Roberts County, Texas Panhandle, just north of the Amarillo uplift and Panhandle fields.

The 1 Parsell Estate was completed flowing 8,000 M.c.f. of gas per day, absolute open flow, from deep lower Morrow - Pennsylvanian perforations at 11,000-05 ft. The well also flowed 1.68 bbl. of condensate per million cubic feet of gas. Top of the lower Morrow formation was logged at 10,372 ft.

The discovery is 22½ miles northeast of Miami in the deeper part of the northwestern Anadarko basin. The Morrow production in this part of the basin is much deeper than in the Oklahoma Panhandle or Southwest Kansas.



Weber Oil Found

Malco strike adds zest to Colorado hunt for this pay

DENVER.—An important discovery for northwestern Colorado was made last week by Malco Refineries, Inc.

Malco, deepening its Buck Peak field discovery well, the 1 Kowach, recovered 1,060 ft. of oil in the Weber Pennsylvanian. The recovery was on a drill-stem test at 10,040-10,120 ft. The original strike was in the Shinarump (Triassic) at 9,353-60 ft.

The new-pay discovery is expected to further step up the search for Weber oil in this area of Colorado, the Piceance Creek basin.

Nearest Weber production is in Thornburg field, 17 miles to the southwest. And the state's deepest well, Phillips Petroleum Co.'s Powell Park wildcat in Rio Blanco County (map) is now below 16,000 ft. on its way to the Weber. Shell Oil Co. is planning a 15,000-ft. Weber test west of White River field.

The 1 Kowach is one of two wells in Buck Peak field. After it found oil in the Shinarump, an offset was drilled. This second well flowed 200 bbl. per day from the Tow Creek and Niobrara-Upper Cretaceous.

Offshore Crude Line Planned

HARVEY, La.—An offshore gathering system to transport crude oil from at least two fields in the Gulf of Mexico will be built soon by the C.A.T.C. Group. The 8 and 12-in. line will extend south from Grand Isle, La., to Blocks 40 and 47.

The group, composed of Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Corp., now has six producing wells in the two fields. Three more are currently being drilled.

About 19 miles of 12-in. line will be laid from Grand Isle to Platform A in Block 47 field. From there, 8-in. lines are proposed to three other platforms in Block 47 and one in Block 40. The smaller lines will total about 5 miles in length.

There will be storage at the Grand Isle terminus for about 50,000 bbl. of crude. Dock facilities well be provided for shipment of crude from there.

El Paso Buys Oil

Deal with Texas operators includes 87 wells, 5 rigs

MIDLAND, Tex.—El Paso Natural Gas Products Co. has paid out $4,925,000 in another deal to expand its young but mushrooming oil operations.

The company, a subsidiary of El Paso Natural Gas Co., bought five rotary rigs, 86 oil wells, and one gasser from L. H. and S. A. Olson Drilling Co. of Midland, and W. R. Weaver of El Paso.

The wells currently are producing about 50,000 bbl. a month or roughly 1,700 bbl. daily.

The sellers were paid with cash, and with stock in El Paso Natural Gas Products, reportedly on about a 50-50 basis.

The production, in South and West Texas, included:

. . . 36 oil wells and 1 gas well in Fort Stockton field of Pecos County, West Texas.

. . . 14 oil wells in Menasco field of Andrews County, West Texas.

. . . 25 oil wells in Linne Poth ("A" Sand) field and 11 oil wells in Kaye-Navarro field in Wilson and Gonzales counties in South Texas.

The production was owned jointly by the Olson firm and Weaver except in Fort Stockton field where each held production separately. The rigs were owned solely by the Olsons. They are all gas rotaries—one depth-rated at about 10,000 to 12,000 ft., the others in the 5,000 to 6,000-ft. range.

El Paso is reported to have kept the newest of the smaller rigs, turning over the others to National Supply Co. The rig retained by El Paso has been moved to the Panhandle area, presumably for use in the parent company's heavy gas-development drilling campaign there.

A spokesman for Olson Drilling said last week the firm went out of business with the sale and that the Olson partners do not plan to continue in the business. Weaver retains some small producing interests and will continue in the business independently.

—— *Industry* briefs

Producing Properties, Inc., Dallas, expanded its SACROC Unit holdings last week by buying the working interest in two more tracts from Gilbert Goodman, Chicago. The company paid $272,500 for the property in the Scurry County, West Texas, unit. It estimates the purchase will add about 265,000 bbl. of oil to its reserves.

Gov. Price Daniel has signed a bill under which Texas will meet the federal Government half way in a study to fix the 3-league offshore line between state and federal tidelands.

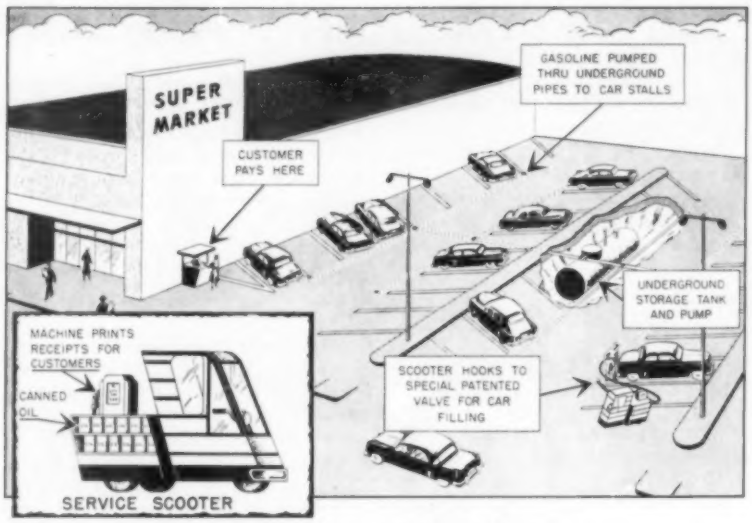
The bill provides $35,000 as Texas' share of the cost of a study with the U.S. Geodetical Survey to draw the Gulf Coast's "low-water contour line." All tidelands 3 leagues from this line will be state-owned, all that beyond will belong to the federal Government.

The official daily drilling-report form, born via joint effort of the American Association of Oilwell Drilling Contractors and the American Petroleum Institute, has now been adapted for use in offshore drilling operations. The conventional report was designed for drilling operations carried out in 8-hour tours. The new version for offshore operations is modified to take data from two 12-hour tours.

A deep test 12 miles from Canada's prolific Pincher Creek gas field has been abandoned after going to 12,727 ft. without any shows.

The well was a joint venture of Gulf Oil Corp. and Pan American Petroleum Corp. It bottomed in the Mississippian limestone, the same formation from which Pincher Creek, one of the largest gas fields in the world, produces. Gulf and Pan American spent about $1 million on the test after paying $91,000 for drilling rights. Location was on Blackfoot Indian tribal land near Babb in northern Montana.

Avondale Marine Ways, Inc., has started construction of an elevating-deck drilling barge designed to operate in 100-ft. water. The vessel, "Loyd Noble S-66," is being built for Noble Barge Co. It will be used by The California Co. in the Gulf of Mexico. The main barge will be 217 ft., 6 in. long with a 100-ft. beam. In drilling position it will be supported by four steel columns, each 12 ft. in diameter.


SUPER MARKET
GASOLINE PUMPED THRU UNDERGROUND PIPES TO CAR STALLS
CUSTOMER PAYS HERE
UNDERGROUND STORAGE TANK AND PUMP
MACHINE PRINTS RECEIPTS FOR CUSTOMERS
CANNED OIL
SCOOTER HOOKS TO SPECIAL PATENTED VALVE FOR CAR FILLING
SERVICE SCOOTER

SHOP-'N-GAS concept of marketing would mean . . .

Supermarts Adding Line of Gas

OKLAHOMA CITY.—A portable service station on supermarket parking lots to gas up the housewife's car while she shops is the latest approach to gasoline marketing.

Kerr-McGee Oil Industries, Inc., is displaying such a service station at the Oklahoma semicentennial celebration here.

The station has no meters or pumps above ground (see drawing above). Service works like this: A housewife shopping for the day's supply of groceries pulls into a supermarket parking lot. Before she leaves the car, she picks up a nearby microphone and places an order for gasoline, oil, water, and a tire check. An attendant then zips up in a special service scooter, hooks a hose from the scooter into a valve in the pavement, and pumps gasoline into the auto tank.

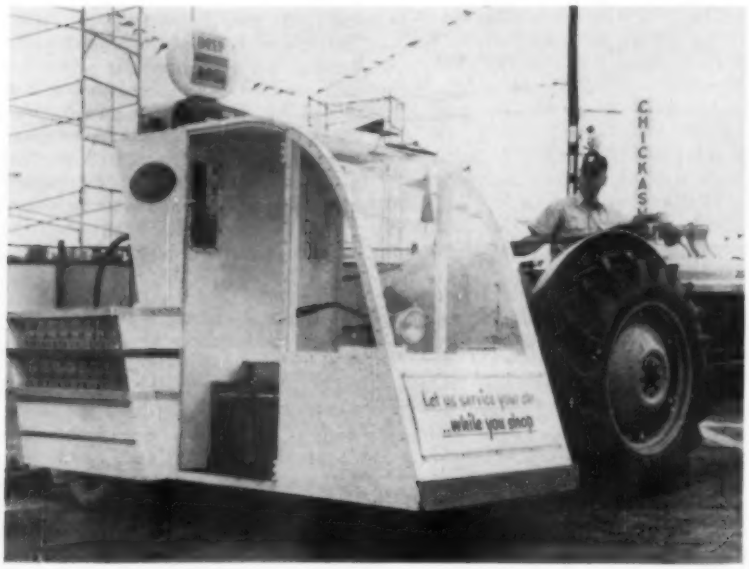
The scooter carries the meter (see photo below). When delivery is completed, it flicks out a ticket with number of gallons, price per gallon, and total price. Supply of canned oil, battery water, and other service aids also are carried in the scooter.

The station itself consists of pipes laid under parking lot stalls and connected with an underground storage tank. A valve on the pipe permits a connection to be made with the scooter hose.

The housewife, meanwhile, can pay her gasoline bill at the store check-out counter or at a special booth on the parking lot. She will be offered only one brand of gasoline—premium.

William Fuchs, Kerr-McGee's merchandising manager, said the shop-'n-gas plan probably will get its first commercial trial at a St. Louis store of National Food Stores, Inc. It has had trial runs at Garden City, Kans., and Erie, Pa. *(The Oil and Gas Journal, August 7, 1954, page 55).*

Under the plan, Kerr-McGee will lease the parking lot, build the station at a cost of $10,000 and turn the operation over to an independent jobber.



Fish Stops Well

Alaskan test had several shows before drill halted

YAKUTAT, Alaska.—Mechanical difficulties forced Colorado Oil & Gas Corp. to abandon its first wildcat in Alaska.

Operations were suspended at 9,314 ft. after the driller was unable to recover 9 drill collars lost in the hole. The well had been projected to 12,000 ft. *(The Oil and Gas Journal, January 28, page 122).*

The firm said a road is being built to a new location 3 miles east of the first test. Drilling will begin early in July with a planned depth of at least 9,000 ft.

"We got encouraging shows in the first well as it moved toward the bottom," a spokesman said, "but after we lost the drill collars we decided it would be more expedient to move to a new location."

The site of the original test was 3 miles southwest of the ice free portion of Yakutat and near the center of 1,100,000 acres leased by Colorado Oil & Gas from the U. S. Interior Department. The acreage is in the southeast Alaskan Panhandle and extends along the Gulf of Alaska from Icy Bay to Cape Fairweather, some 1,000 miles northwest of Seattle, Wash.

The Colorado Oil & Gas wildcat is south of the Icy Bay acreage where Phillips Petroleum Co. has drilled three wildcats. Phillips has had non-commercial shows in two wells and is testing the third.

Associated with Colorado Oil & Gas in Alaska is Frankfort Oil Co., a division of Calvert Distilling Co. Drilling contractor is Haney & Williams Drilling Co., Long Beach.

Borneo Tested Offshore

● Shell's three-prong campaign includes shallow-water multiple-well program from single platform near Seria

BRUNEI Shell Petroleum Co. last week launched a shallow-water drilling platform that will be used to drill a dozen wells about a mile offshore from Seria field in British Borneo.

A square-crowned Ideal 100 rig will be used for the multiple drilling program. Plans are to drill the wells in groups of four by shifting the crown block for each new hole. After the first four are completed, the rig will be skidded on the platform for another group of four wells.

This will not be the first multiple drilling program from a single platform, but it is a far more elaborate scheme than any previously tried by the Shell company. About 3 years ago, the company drilled one vertical and three slant-hole wells from its offshore platform off Seria field. Three were successful oil producers and the fourth made a gas well.

The new platform is the latest move in an all-out campaign started a year ago to extend the prolific, but declining Seria field into the sea *(The Oil and Gas Journal, May 14, 1956, page 118)*. It is also part of a three-company effort to find new Borneo oil.

Just a week before the new platform was launched, the company abandoned one of its more ambitious drilling ventures in the South China Sea 30 miles off the coast. The Ampa Patches test was abandoned and plugged at 6,000 ft. after months of tough drilling in plastic-type clay formations. There were no shows.

The Ampa Patches platform will be left at the location in spite of the dry hole. A mobile drilling barge is being built for the company in Hamburg, Germany, and will probably be used in the same general area for further testing.

Seria field, easily the Far East's largest, has produced more than 370,000,000 bbl. since its discovery in 1929. Its current production is 114,000 bbl. daily, about 9,000 bbl. daily more than last year's average. But the land limits of the field have already been well defined.

Offshore switch . . . The move to offshore locations was started initially 3 years ago by British Malayan Petroleum Co., the predecessor Shell company. A year ago it was begun on a full-scale basis.

Since then the three sister Shell companies which operate in Borneo have all taken to the water. Sarawak Oilfields, Ltd., the Shell company which operates the declining Miri field in Sarawak, south of Seria, will spud an offshore well at Siwa early next month. This is 8 miles at sea and 18 miles from Miri. The platform is of modern construction with air-conditioned crew quarters and helicopter ports.

To the north, Shell Company of North Borneo, has launched a platform for a location at Hankin Shoal, about 30 miles north of the island port of Labuan. This test is not expected to be spudded until early next year.

The three-pronged Shell effort to find underwater production is the result of disappointing efforts to find new oil on land in Borneo. No new discoveries have been made since World War II, except for the flash-in-the-pan find at Jerudong which was at first hailed as a major find.

Only the discovery well is producing at Jerudong. Five dry holes were drilled. The company plans to abandon Jerudong field as soon as the one well is depleted. It produces about 560 bbl. daily, but the geology of the region and 5 dry holes have discouraged further efforts.

To meet their demand for drilling platforms for the major exploration in the South China Sea, the three Shell companies have pooled construction efforts at a marine yard at Kula Belaitan Brunei. They are turning out prefab drilling platforms in almost assembly line fashion. A dozen are now available.

Shell Orders New Platform

Royal Dutch-Shell has placed an order for a new drilling platform to replace the one wrecked last year in the Persian Gulf.

Bataafsche Petroleum Mij. ordered the platform from Gusto Shipyards, Schiedam, Netherlands. Delivery will be made at the end of 1958.

The platform will enable Shell Co. of Qatar, Ltd., to resume its offshore drilling program near Qatar after a 2-year setback. The first well will be located in the north half of the concession, 35 miles from the nearest land and in 80 ft. of water.

Shell's original 1,900-ton platform was heavily damaged in December when under tow to its third location. The company seriously considered dropping the program after the accident *(The Oil and Gas Journal, February 11, page 88)*.

Egypt Hikes Output

Level hits 4-year high as Belayim field shifts gears

THE LONG-AWAITED development of sizable output from Belayim field on Sinai Peninsula appears to be getting under way.

Output averaged a record 11,900 bbl. daily in April. This compared with 1,900 bbl. daily in March, the first month of operations following the withdrawal of Israeli troops which overran the field last year.

The field, small by Middle East standards, is important to the Egyptian economy because it is expected to shore up the country's declining production. Belayim, along with 600 bbl. daily from nearby Feiran, helped push total output in the country in April to 46,000 bbl. daily, the highest level in nearly 4 years.

Ownership . . . The fields are held by Cie. Orientale des Petroles d'Egypte. Egyptian agencies have 49 per cent interest and International Egyptian Oil Co. has 51 per cent. International Egyptian is controlled and managed by Cie. Financiere Belge des Petroles (Petrofina) and Ente Nazionale Idrocarburi (E.N.I.), the Italian state oil agency.

Southern California Petroleum Corp. of Los Angeles, which had served as operator, sold its interest last year *(The Oil and Gas Journal, August 6, 1956, page 72)*.

Both Belayim and Feiran are on a 60-sq.-mile concession given up in 1949 by a Standard Oil Co. (N.J.) subsidiary, largely because of unfavorable oil legislation.

Last year Belayim averaged 5,400 bbl. daily. Output was up to 6,700 bbl. daily in October when operations were suspended. There were 12 completed wells.

Four rigs are running in the area. Three are on development drilling in Belayim. The fourth is drilling a second well as Rudeis, a new field.

OPERATION HELIRIG slashes costs in dense-jungle campaign as ...

Deep Tests Probe New Guinea

A BRITISH - AMERICAN - AUSTRALIAN oil operation is counting on three big helicopters to help get back the more than $36 million that companies have spent in an unsuccessful 20-year search for oil in one of the world's thickest jungles.

The big whirly-birds haven't found any oil yet, but they are responsible for the spudding of two deep tests in a much shorter time and for a lot less money than would have been possible a few years ago.

Last week Australasian Petroleum Co., Ltd., and Island Exploration Co., Ltd., had two 10,000-ft. rigs running deep in the interior of Papua, New Guinea. Every piece of equipment for both operations was hauled into the deep and almost impenetrable jungle by air. It meant a saving of thousands of dollars and months of time involved in hacking a roadway through the jungle.

Komewu 1, 80 miles from the coast and in the area about 50 miles west of Omati, is drilling below 3,000 ft. Another test 18 miles to the east, Sireru 1, was recently spudded.

Locations for each well were staked, cleared, and the rigs set up in a matter of weeks. Previously it has taken as long as 17 months to build roads to test sites in this area of the world. The big Sikorsky S-58 helicopters made the difference.

The Komewu site is 8 miles from Victory Junction, the limit of navigation on the Aworra River. The 'copters picked up two specially packaged National 50 rigs at Victory Junction and shuttled both to the drill sites in loads of 4,000 lb. One helicopter hauled 33 tons of cargo in a 10½-hour period—all of it over jungle that could hardly be covered on foot.

How it started . . . The "helirig" operation was born a year ago when a shallow test was drilled successfully in the jungle of Salawati off the coast of West New Guinea. The test was dry, but hauling all the equipment into the jungle and out again by helicopter was a huge success *The Oil and Gas Journal, July 16, 1956, page 80).*

The only hitch in the Salawati operation was the 4,800-ft. depth of the well drilled with a light rig. Heavier helicopters were needed, for heavier equipment.

The two companies operating in Papua are owned by Standard-Vacuum Oil Co., British Petroleum Co., Ltd., and Oil Search, Ltd., an Australian firm. Stanvac and B.P. are the major owners.

Before turning to the airborne type of operation the companies spent about $36 million exploring the Australian-owned territory over the past 20 years. The frustrating search has been made doubly expensive because the Papuan jungle is fed in some areas by rainfall up to 350 in. a year. This builds thick jungles, but the helicopters don't seem to notice.

New Israel Pool?

Heletz field, new strike are separated by dry hole

ISRAEL'S new test southeast of Heletz field, apparently is a new field well on the Heletz trend.

The 2 Broor Haiel is 5 miles southeast of the field's most southeasterly well, Heletz 10. It topped 15 ft. of net pay at 4,990 ft. The tests are under way.

Geologists familiar with the area think a new field on the trend is likely since the 1 Broor, drilled between 10 Heletz and 2 Broor, was a dry hole.

The 1 Broor was a double outpost from 10 Heletz and is 2,600 ft. northwest of 2 Broor. It was structurally high and a MicroLog showed porosity. This indicates the Lower Cretaceous sands dip to the south and then rise.

The joint operators, Lapidoth Israel Petroleum Corp., Ltd., and Israel Prospectors Corp., Ltd., are drilling past 3,000 ft. on a deep test, 22 Heletz, 2 miles north of the discovery.

The well is located on the highest part of the field and is the first test projected to go to basement. A new rig capable of 15,000 ft. was brought in for the well.

Pan Am Busy in Islands

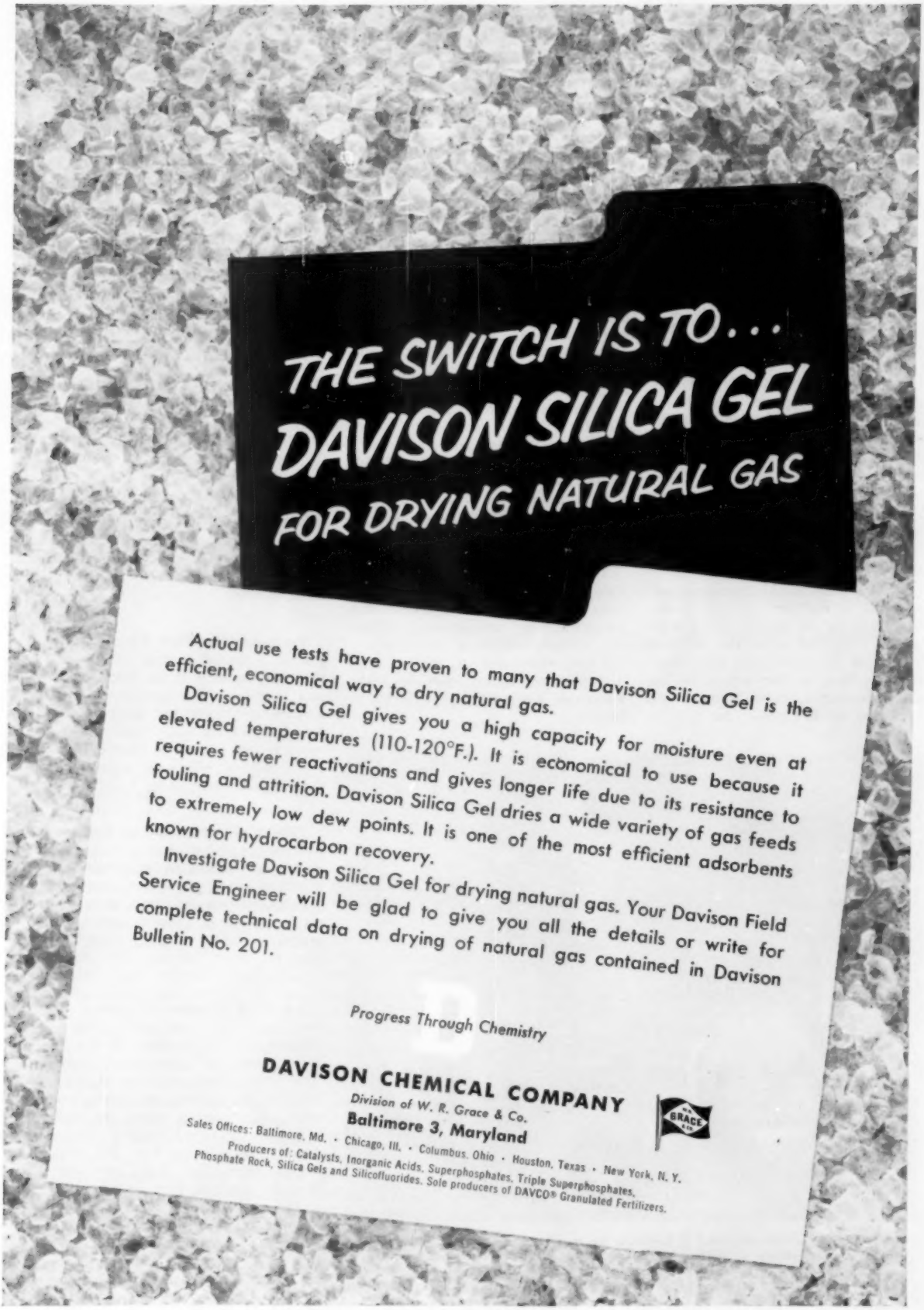
One Caribbean subsidiary of Pan American Petroleum Corp. has started a new test on Jamaica and another is getting ready to spud offshore from Cuba.

Pan Jamaican Oil Co., formerly Jamaican Stanolind, is drilling 1 West Negril on the southwestern tip of the island in the Negril Hill area. The test is about 1 mile west of 1 Negril, the first well on the island.

The 1 Negril was drilled by Base Metals Mining Corp., Ltd., which farmed out the entire island to Pan Jamaican. No. 1 Negril and two wells drilled later by Pan Jamaican were dry.

Cuban Stanolind Oil Co. will sink its offshore well about 15 or 20 miles from shore in water ranging from 6 to 8 ft. deep. Location is due south of Jatabonico field, which is almost in the center of Cuba. The company will build a coral island from which it will carry out drilling operations.

Pan American is active in the Caribbean through still another subsidiary, Pan Venezuelan Oil Co., which recently changed its name from Venezuelan Pan American Petroleum Co. Pan American is a Standard Oil Co. (Ind.) subsidiary.


THE SWITCH IS TO...
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GRACE

Government finally acts:

North Sumatra May Be Revived

THE INDONESIAN Government may be getting off dead center from its do-nothing policy on North Sumatra fields.

How soon and under whose operation the shut-in and neglected properties will open is still a big question. But after a lapse of several years, the fields are now under a set of general regulations.

The regulations indicate the government intends to keep control. They give authority to the ministry of economic affairs. In turn, the ministry is to set up a corporate body to handle operations. Mining rights will be granted to the corporation with the stipulation that payments to the government must meet provisions of the country's tax laws.

Presumably the government has a public corporation in mind. But there is no specific indication the fields could not be later transferred to a private company.

Last year the government announced a decision not to return the fields to the Royal Dutch-Shell Group *(The Oil and Gas Journal, November 5, 1956, page 83)*. However, in light of the prospering industry further south in Sumatra and elsewhere in Indonesia, the government would have good reason to reconsider its stand.

Big expansion . . . Heavy investments by Caltex, Standard-Vacuum Oil Co., and Royal Dutch-Shell in recent years have maintained the country as the seventh ranking crude producer in the free world.

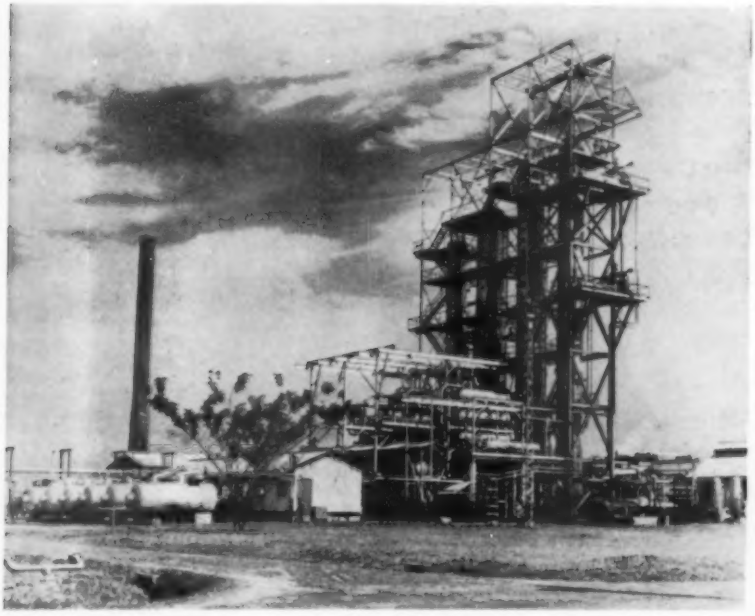
Caltex production is now past 143,000 bbl. daily with much of its expansion program in Central Sumatra still incomplete. Stanvac will add 20,000 bbl. daily to its present 60,000 bbl. daily when it completes the Lirik field pipeline later this year.

Royal Dutch produces more than 100,000 bbl. daily from fields in Sumatra, Java, Ceram, and Kalimantan.

Royal Dutch owned the North Sumatra fields before World War II. The fields accounted for about 22,000 bbl. daily when total Netherlands East Indies production was at 180,000 bbl. daily.

The operating subsidiary, Bataafsche Petroleum Mij., never resumed operations after the war, although the young government did not seriously dispute the company's rights of ownership.

Local companies at present have negligible production from the North Sumatran fields—150 bbl. daily or less.



EXPANSION by private companies in Indonesia has meant a steady growth and prosperity for most of the nation's oil industry. This gas plant at Pladju, Sumatra, operated by Bataafsche Petroleum Mij., affiliated with the Royal Dutch-Shell Group, typifies the settled conditions. But one big question remains: Now that the government has taken some action in North Sumatra, will B.P.M. get back its fields there?

World briefs

Libyan American Oil Co. has started its third well in northern Cyrenaica. The location is 200 ft. from the second hole which was given up after pipe twisted off at 2,500 ft. The Texas-Gulf Producing Co. subsidiary had a dry hole on its first test, 50 miles west.

Cia. Peruana de Petrole "El Oriente," S.A., is drilling the second stepout from its discovery in eastern Peru. The first stepout came in as a producer. It is a tight hole. But industry reports indicate the well is "pretty good." The discovery, 1 Maquia, tested about 600 bbl. daily in March. It was the first discovery in Peru's Amazon basin since 1938 *(The Oil and Gas Journal, April 8, page 86)*.

A new drilling depth record has been set in West Germany. Erdoel A.G. and Wintershall A.G. are drilling ahead below 12,853 ft. at the Sterup Steinfeld Z 1 in Schleswig-Holstein. The earlier record of 12,632 ft. was made in 1950.

Trans-Arabian Pipe Line Co. delivered a record average of 380,000 bbl. daily in May at the Sidon, Lebanon, terminus. This compares with an average of 338,400 bbl. daily the first 5 months of the year. Tapline's previous record was set in October 1954 when 362,700 bbl. were delivered at the Mediterranean port.

Esso A.G. will build an $11,500,000 petrochemical plant in West Germany, in connection with the new 68,000-bbl. refinery now under construction at Cologne. Both plants will go on stream in 1959. Esso A.G. is affiliated with Standard Oil Co. (N. J.).

An A. S. Onassis T-2 tanker was badly damaged last week when it collided with a freighter in the Atlantic Ocean off the French coast. The Stony Point was carrying 118,000 bbl. of crude from Sidon, Lebanon, to Antwerp when the collision with the Greek freighter Ioannis occurred in a heavy fog. The Stony Point caught fire. Eight men were reported dead at first count.

The tanker was one of the T-2's recently transferred from the United States to Liberian flag. U. S. Petroleum Carriers, Inc., of New York, an Onassis company, is operating agent.

SPECIAL SECTION ON

REFINERY MAINTENANCE

CONTRACT vs. DO-IT-YOURSELF

Here's why more and more refiners are farming out their routine maintenance

By D. H. Stormont
District Editor

WHY ARE more refiners and chemical plants farming out their routine plant maintenance to contractors, rather than continuing to "do it yourself"?

- Refiners using contract maintenance, and firms offering the service say contracting increases efficiency and reduces costs.
- By having a large labor force available when needed, units can go back on stream quicker. By holding the permanent labor force to a minimum, pension, sick leave, and other fringe-benefit liabilities are reduced. Less capital outlay is required for maintenance equipment which may be used only a few weeks a year.
- The constantly increasing size and complexity of modern refineries do not allow the flexibility in maintenance that was possible when individual units represented only a portion of the skimming or cracking capacity. Then, by providing adequate storage and taking a longer time for the turnaround, maintenance could be performed by company crews.

With today's high maintenance costs and low margins of profit, it is no longer practical to lengthen the turnaround periods and do the work with a constant daily maintenance crew. Nor is it economical to increase the daily maintenance crew to the size necessary to meet the shutdown schedules. There is not enough work to keep such large daily crews productively occupied during the between-turnaround periods.

Even when shutdown schedules are met and advance plans for allocating manpower are followed, job requirements of the turnaround may change abruptly after it has started. Unforeseen repairs and delays in progress may change the total manpower requirement as well as the type of craft required.

By contracting maintenance, bulk of the varying labor demand is met by the contractor. Fringe benefits, which now constitute a substantial portion of the total costs of labor, can be held to a minimum.

The Manpower Problem

The chief engineer for one company which contracts for most of its maintenance summed up the situation as:

"Biggest advantage of contract maintenance is the ease of acquiring and doing away with manpower. A refiner can build up manpower only gradually because of his limited contacts with union hiring halls. A contractor, because he is constantly in and out of hiring halls, can supply dozens of men in the required crafts on a day's noitce."

... On pay scales, he said: "The hourly wage paid by the contractor is somewhat above that paid by the company to craftsmen doing identical work. Pensions, paid vacations, and other fringe benefits, plus all the additional office expense connected with bookkeeping, more than offset the difference in hourly wages, however.

"Contractors' crews likewise are probably more productive. Maintenance contractors recognize only two 'can'ts'—if a man can't give them a day's work for a day's pay, he can't stay. An oil company does not have this much freedom in dealing with union personnel."

Basically there are two types of contract maintenance.

In **contract turnaround mainte-**

MANPOWER PROBLEM

"Biggest advantage of contract maintenance is the ease of acquiring and doing away with manpower. A contractor, because he is constantly in and out of hiring halls, can supply dozens of men in the required crafts on a day's notice."

nance, an outside contractor is brought in to furnish the manpower to perform a defined portion of a shutdown. The contractor also may furnish special equipment needed for the job. Upon completion of the work everyone is laid off.

Term, or variable contract maintenance, which is more efficient and economical than contract turnaround, is the type being more widely used.

Under this type of contract the contractor furnishes a definite number of semipermanent employes for daily routine maintenance work. This provides him with a nucleus of experienced and qualified personnel who know the refinery, maintenance, organization, and operating units. They also are familiar with procedures as well as all refinery or plant safety rules.

From this nucleus the contractor draws his additional foremen for turnaround periods, when crews are greatly increased for short periods of time. The semipermanent crews are handpicked for their general all-around ability in their craft. They also must have the potential ability to act as foremen when required to supervise and direct new temporary employes.

This type of contract maintenance tends to train additional craftsmen in the area for maintenance work. In time there is a good pool of experienced maintenance personnel to draw from when needed for turnarounds.

Jobs Performed

Fluor Maintenance, Inc., was one of the early pioneers in the contract-maintenance field. In its existing contracts it furnishes the crafts listed below for both turnarounds and daily routine maintenance. The crafts, and a brief summary of the types of work performed by each, are as follows:

1. Boilermakers
- (a) Operate shop equipment as required.
- (b) Make any and all repairs on towers, vessels, exchangers, tanks, condenser boxes, heaters, etc., to the extent desired by client (perform own rigging).

2. Carpenters
- (a) Operate woodworking shop equipment.
- (b) Routine repairs and alterations, shutdown repairs.
- (c) Erect scaffolding and staging as required.
- (d) Heavy timber repairs.

3. Electricians
- (a) Maintain substations and switch houses.
- (b) Make any and all repairs to plant electrical distribution system.
- (c) Perform any electrical work that falls into the maintenance service or repair categories.

4. Insulators
- (a) Remove, repair, or replace insulating materials.

5. Laborers
- (a) General refinery cleanup.
- (b) Clean turbine heater tubes, lines, etc.
- (c) Clean and sandblast towers, vessels, exchangers, condenser boxes.
- (d) Some tank-cleaning and pipe wrapping.
- (e) Washing and chemical cleaning of exchanger bundles.
- (f) Cleanup in units during turnarounds.
- (g) Miscellaneous concrete work, etc.
- (h) Cleaning plugged sewers and process lines.

6. Mechanics
- (a) Operate shop equipment.
- (b) Make shop or field repairs, on pumps, valves, compressors, blowers, operate tugger hoists, cranes, etc.

7. Painters
- (a) Clean and prepare surfaces by wire brushing or sandblasting for painting.
- (b) Handle own scaffolding.
- (c) Repainting of units, buildings, tanks, pipe lines, equipment, etc.

8. Pipe fitters
- (a) Make repairs to piping and valves as required.
- (b) Make field measurements and layout sketches.
- (c) Remove and replace piping valves, etc.
- (d) Perform any and all work as necessary in the pipe-fitter category.

9. Pipe-fitter welders
- (a) Pipe-welding field or shop.
- (b) Lay out and fabricate replacement piping.
- (c) Operate stress-relieving equipment.

10. Truck Drivers

(a) Man client-owned trucking equipment.

(b) Haul materials and equipment to various jobs in the plant or refinery.

How it works . . . Under term or variable contract maintenance, the contractor becomes a component part of refinery management. The semipermanent force of the contractor acts as a flexible extension of the refinery's own maintenance force. Through the contractor's resident superintendent, the experience and know-how of a large engineering and construction company are made available to the refiner.

In carrying out routine maintenance, the usual raito of company to contractor employes in the basic maintenance crew is about 2 to 1. It may vary widely in either way. On one extreme the contractor may perform all maintenance; on the other extreme he may provide only certain specialized crafts.

Union Oil Co. . . . At its Oleum refinery, where Fluor Corp. and Fluor Maintenance, Inc., have been contracting maintenance since 1948, Union Oil Co., maintains a full-time force of 175 men.* About 50 of these are supervisory, clerical, and planning personnel. The contractor's semipermanent force totals about 125. These include foremen and workers in all crafts except instrument men, who are company employes; and brickmasons, who are supplied by a specialized contractor.

At its larger Los Angeles refinery, Union has a maintenance staff of about 200. The firm of Burke & Reynolds, a pioneer in routine contract maintenance, supplies an additional 100. These include all crafts except painters, insulators, electricians, and brickmasons.

In day-to-day maintenance this contract force is headed by a superintendent who is responsible to the refinery-maintenance superintendent. Through the latter's planning group, job orders from the operating department are issued to either contract or company craftsmen as the size and type of job and manpower availability warrant.

Contractor and company craftsmen do not work on the same job at the same time, but they may be working alongside one another. A contractor crew also may replace a company crew if a rush job is not completed at the end of the day shift. On the whole, the company maintenance organization is unchanged by the presence of the contractor personnel; they are just part of the maintenance force.

*John W. Towler, "How to Get Manpower for Turnarounds," The Oil and Gas Journal, July 11, 1955, page 119.

> "With today's high maintenance costs and low profit margins, it is no longer practical to lengthen the turnaround periods and do the work with a constant daily upkeep crew. There is not enough work to keep such large daily crews occupied during the in-between periods."

The chief engineer for one refinery using this type of contract maintenance said that one advantage offered is that "we don't have all our eggs in one basket.

"By dividing the routine work load between contractor and company forces, neither has the upper hand. Where the shops are divided this way, competition is higher to turn out better work. There also is a tendency for contractor and company crews to compete safetywise to see which can turn in the better record."

Working together . . . For turnarounds the contract superintendent obtains the necessary labor forces to complete the work in the allotted time. During this period craftsmen in the contractor's semipermanent force step up from journeymen to subforemen or foremen.

Turnaround planning is done by the company shutdown planning group. But experience has shown that the contractor can materially contribute to making it a smooth operation.

In the case where a semipermanent contractor force is at the plant, key foremen work with the planning engineer prior to the shutdown. They assist in making manpower-requirement estimates. They advise on assigning turnaround work to the proper crafts, thereby avoiding jurisdictional disputes. Also they make recommendations on how to do the job economically, efficiently, and safely.

The contractor also benefits from such a cooperative study. It enables the contractor foremen to become thoroughly familiar with all the jobs to be done during the turnaround.

How to keep UPKEEP DOWN!

Company functions . . . Certain functions of refinery maintenance are best performed by company personnel, however. Experience has shown, according to Flour Maintenance, that greater efficiency and economy result if the refiner:

1. Furnishes its own daily and turnaround planning group.

2. Furnishes its own key personnel for corrosion inspection and for keeping corrosion records.

3. Furnishes its own fire and safety inspector.

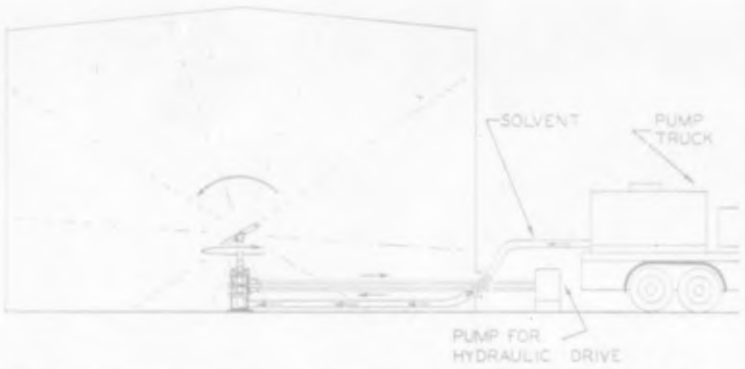
4. Furnishes a liaison man to act as go-between for the operations and maintenance groups during a turnaround.

Some refiners, both large and small, continue to perform all their own daily maintenance. Best evidence that it can consistently be carried out more efficiently and at a lower cost by contract is the trend toward contract maintenance, one contractor pointed out.

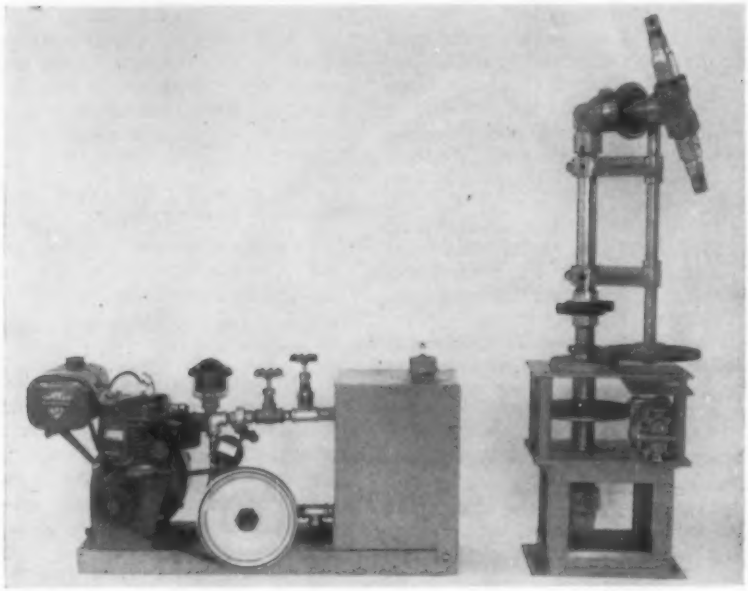
The maintenance superintendent for a refinery using the variable contract type of maintenance is sold on the values of contract maintenance. But, as he told The Oil and Gas Journal in an interview, "I can't say whether we are doing a better or poorer job than we would have if all maintenance had been company performed.

"The final cost of maintenance is a very complex subject. Because of the many changes made in our plant in recent years, there is no basis for comparing today's maintenance costs with those of several years ago.

"It is even more impossible to compare costs of one refinery with those of another, even if they are of similar size and owned by the same company. What might be considered a maintenance cost in one plant will be charged off as an operating cost in another plant." **End.**



1. Chemical solvents are jet sprayed on tank interiors



2. . . . by this hydraulic motor-driven sprayer

How Four Storage Tanks Got a Thorough Cleaning

By W. R. Jameson and H. B. Green

TERMINAL storage companies constantly face the tank-cleaning problems common to all industries that use product storage tanks. In the past, tank cleaning has often been expensive, time-consuming, and dangerous. New cleaning methods based on the use of chemicals and special application devices have largely eliminated these difficulties.

Authors are with Hess Terminal Corp., Houston, and Dowell Incorporated at Houston, respectively.

Solvent Application—"Zingger"

The liquid solvents used in chemical cleaning reach parts of tanks which are not accessible by other methods. Solvents used include alkaline materials, acids, petroleum-base solvents, chlorinated solvents, and various types of emulsions. They are applied by two basic methods, soaking by filling the tank, and spraying on tank walls. In most cases, spraying is done by a specially designed mechanical tool which sprays chemicals, at a high impingement velocity, on all internal tank surfaces. This device, called a "Zingger," is remotely controlled from outside the tank, so that the chemicals can be directed against a single area or evenly over all surfaces in turn.

Fig. 1 is a schematic drawing of the tool installed within a tank. Fig. 2 is a photograph of the tool. In Fig. 3, a pump truck is shown on location, connected (by the treating line in the foreground) to a Zingger within the tank from which the photograph was taken.

Sand-Blasting and Hand Cleaning

Terminal storage companies clean tanks most often in order to change the product being stored. Other reasons for cleaning tanks are to make repairs, to prepare for painting, and to remove sludge or corrosion products. A common practice in the past has been to use hand scrapers, brushes, or motorized brushes. In some cases, mild chemical solutions have been applied through hand-held hoses. Sandblasting has also been a commonly used method of cleaning both internal and external tank walls.

These cleaning methods have several disadvantages in comparison with chemical cleaning methods. Sandblasting is more expensive than chemical cleaning, and often cannot be used because the sand might contaminate motors, food products, or other materials. Removal of spent sand is also a problem.

Cleaning tanks by hand . . . This is often costly, both in actual cleaning costs and in the outage of storage tanks while they are being cleaned. For example, to clean properly a 50,000-bbl. tank that has previously stored No. 6 fuel oil in order to place it in "clean" petroleum service required from 4 to 8 weeks by hand or mechanical methods. By contrast, such a tank can be chemically cleaned in from 3 to 5 days.

The loss that a company suffers in being deprived of these storage facilities for the additional 4½ to 7½ weeks is substantial. It is apparent that the number of tanks needed on a tank farm to store a given amount of fluid can be greatly reduced when the tanks are cleaned and restored to service quickly. In most cases, the

3. High-power, truck-mounted equipment pumps the chemical solvents, at high pressure, to the jet sprayers in the tanks being cleaned.

direct costs of cleaning tanks by hand, even without considering the cost of outage, are greater than the cost of cleaning them chemically.

How effective? . . . The effectiveness of hand cleaning methods also leaves much to be desired. It is almost impossible to clean all parts of a tank equally well by manual methods. Too often workmen may unintentionally neglect small areas, thus not cleaning the tank thoroughly. Hand cleaning is usually only as effective as the person supervising the job chooses to make it.

In many cases, chemical cleaning methods must be employed because mechanical means have been ineffective or have failed. Emulsified or blended solvents, applied through a Zingger, remove deposits quickly and thoroughly. Because it is almost impossible to clean completely all parts of a tank by hand, highly refined products with exacting standards of purity often cannot be stored in manually cleaned tanks.

Personnel safety . . . Another problem, that of personnel safety, has also been solved by the use of chemical cleaning methods. Residual materials, dangerous to personnel, must often be cleaned from tanks. Despite the use of all standard safety devices, such cleaning operations are hazardous. Under such conditions, hand cleaning methods are particularly dangerous. For example, residues of such materials as insecticides and other poisonous chemicals can be removed safely only by chemical means.

All types of tanks . . . Chemical cleaning methods can be applied to almost any type of tank. These methods have been used on all types of field storage tanks, both with cone roofs and floating roofs, spheroids, vertical small tanks, railroad tank cars, and tanks in barges and ships.

How to keep UPKEEP DOWN!

Types of Deposits

Many different types of deposits have been cleaned from internal tank surfaces. Heavy oil deposits from storage of No. 5 and No. 6 fuel oils, 25°-gravity cycle oil, 17°-gravity cycle oil, and crude oils have been successfully removed, along with considerable amounts of iron oxide and mill scale that are usually present. Tanks with these deposits have been cleaned so thoroughly that they could be used for the storage of light-hydrocarbon fractions, such as toluene, toluol, and benzene. Heavy bottom settlings from crude-oil storage have been removed by using Zinggers to churn up the settlings and liquefy them. Light heating oil has been the solvent ordinarily used.

Deposits on tank walls often vary greatly, even between two tanks that have held similar products. Although there are general principles which apply to all tank-cleaning jobs, usually each tank to be cleaned has particular problems which must be considered. Each cleaning job must therefore be considered as an individual case.

Safety Precautions

Safety precautions should always be observed when cleaning tanks.

- All jetting and spraying equipment should be **grounded** for protection against static charges within the tank.
- Before the cleaning process itself begins, tanks should be as gas-free as possible. In most cases, the owner also has the tank floor covered with enough water to retard liberation of gas from scale, rust, or other deposits.
- Cleaning personnel should wear protective clothing when working in tanks containing vapors that may harm the skin. Gas masks should always be worn by personnel working inside tanks having deposits that can liberate toxic gases. No personnel should remain inside a tank while solvents are applied.

Case Histories

A clear picture of the techniques and materials used in tank cleaning can be gained from the case histories which follow. They include a variety of tank-cleaning problems commonly met.

Case History No. 1 . . . A cylindrical tank, 30 ft. in diameter and 16 ft. tall, was to be converted from storage of Bunker C fuel oil to storage of distilled water in a power plant. This tank was first flushed with cold water,

applied at approximately 300 psi. Bottom settlings and residue were then removed from the tank by a vacuum truck.

Next, the ank was sprayed with a solvent containing hydrocarbons and a wetting agent, emulsified with inhibited hydrochloric acid. The solution was applied to all internal surfaces. The emulsion, which clung to the walls, was allowed to remain for about 6 hours. It was then washed off with water, followed by a mild alkaline neutralizing solution. A rust-retarding passivation material was then sprayed on the walls. Inspection of the tank showed it to be completely free of both organic and inorganic deposits.

Case History No. 2 . . . Three tanks that had been used for many years to store heavy fuel oil, approximately 5° or 6° gravity, were cleaned for use in gasoline storage. These were 55,000-bbl. tanks, 114 ft. in diameter, and about 30 ft. in height. Each tank had two rows of internal columns supporting the roof.

After the bottom settlings had been hauled to a refinery for rerunning, an emulsified solvent containing a light oil, a wetting agent, and inhibited hydrochloric acid was applied to wall, roof, and column surfaces. The total time required for completely cleaning the three tanks, including setting up and removing equipment from one tank to another, was 19 working days.

Case History No. 3 . . . Another storage tank was cleaned to remove tallow. A Zingger was installed in the center of the tank and water pumped through it over internal tank surfaces. A hot alkaline solution was then applied. The solution was kept hot by means of a jet-stream heater. Total contact time and pumping time was 8 hours. Inspection showed that the tank was clean.

Case History No. 4 . . . An 80,000-bbl. storage tank that was to be used to store benzene was cleaned to remove cottonseed-oil residue. Because benzene has high purity standards, it was necessary to completely remove all residue.

The tank was washed by water, followed by an alkaline solution containing a detergent, sprayed continuously for several hours. The tank was particularly difficult to clean because some of the deposits had polymerized. This material clung tightly to the walls and resisted most types of chemicals applied to it. In many instances, it was necessary to use high-pressure jetting in combination with solvents in order to remove the deposits. The total time required for cleaning this tank was 12 working days. **End.**

TABLE 1—MAINTENANCE CONTRACTING, U. S. AND CANADIAN REFINERIES

Capacity (bbl./stream day)	Total U. S. and Canadian ref. by size	No. plants using contract maint.	No. plants not using contract maint.	No. plants not replying
0- 1,000	15	2	5	8
1,100- 2,000	37	3	15	19
2,100- 3,000	22	3	11	8
3,100- 4,000	20	1	9	10
4,100- 5,000	25	5	9	11
5,100- 7,500	32	8	11	13
7,600- 10,000	23	6	9	8
10,100- 15,000	27	11	7	9
15,100- 20,000	21	9	7	5
20,100- 25,000	16	6	7	3
25,100- 30,000	16	7	4	5
30,100- 35,000	11	3	4	4
35,100- 40,000	9		6	3
40,100- 50,000	16	9	2	5
50,100- 60,000	11	6	3	2
60,100- 70,000	7	1	1	5
70,100- 80,000	7	3	2	2
80,100- 90,000	5	3	1	1
90,100-100,000	3	3		0
100,100-120,000	4	2		2
120,100-140,000	5	3	1	1
140,100-160,000	3		2	1
160,100-180,000	2	1		1
180,100-200,000	4	2		2
200,100-220,000	1		1	0
220,100 and over	5			5
Total U. S. and Canadian plants	347			
Total replies using contract maint.		97		
Total replies not using contract maint.			117	
Total not heard from				133
Total heard from	214 (62%)			

JOURNAL SURVEY SHOWS . . .

Plant Size No Factor In Determining Whether To Contract Maintenance

Here's a plant-by-plant breakdown

By L. Turner
Director, Editorial Research

CONTRACT maintenance is used more frequently by refiners for unit turnarounds than for routine maintenance during operation. This is evident from a recently completed survey by The Oil and Gas Journal of all refineries in the United States and Canada.

The survey also shows that most plants using contract maintenance for both turnarounds and during operation, use a higher percentage for turnarounds.

Apparently there is no correlation between use of contract maintenance and size of plant, geographic location, or the company's status as an independent or major. This is based on replies which represent 62 per cent of all refineries now operating.

Fifty-five per cent of surveyed refineries do not use any contract maintenance. Of the 45 per cent employing some percentage of outside maintenance, 19 per cent apply it to unit turnarounds only, 4 per cent to routine maintenance only, and 22 per cent to both.

Good cross-section . . . The breakdown of plants by capacity in Table 1 shows that the survey replies represent a good cross-section sample of the over-all industry. The first column includes all plants operating in the United States and Canada. Column 2 shows the number of plants reporting use of contract maintenance, and the third column shows number of plants employing no outside maintenance. Comparison of Column 4, number of plants not reporting, with Column 1, affords a quick appraisal of how representative the survey figures are of the entire industry.

In Table 2, the percentage of contract maintenance used for unit turnarounds and for routine maintenance during operation is shown by number of plants. Twenty-three of the plants replying to the Journal survey are not represented in this table. They reported use of outside maintenance, but did not report percentage figures.

Judging from the tabulations in Table 2, most refineries employing contract maintenance apparently do so only at peak periods. This is indicated by the concentration of plants in the percentage brackets from 1 through 15.

Table 3 reflects percentage of contract maintenance used compared to capacity of the plant.

TABLE 2—CONTRACT MAINTENANCE BREAKDOWN, ROUTINE AND TURNAROUND

Per cent	No. plants using for unit turnaround	No. plants using for routine maint.
1- 5	11	7
6- 10	14	10
11- 15	7	8
16- 20	4	1
21- 25	5	
26- 30	2	2
31- 35	1	
36- 40		1
41- 45		
46- 50	8	2
51- 55		
56- 60	1	
61- 65		
66- 70	4	
71- 75	2	1
76- 80	3	
81- 85		1
86- 90	2	1
91- 95		
96-100	4	3
Total	68	37

Table 3—Per Cent of Maintenance Contracted for Various Refinery Capacities

Capacity (bbl./stream day)	0-5 TR	6-10 TR	11-15 TR	16-20 TR	21-25 TR	26-30 TR	31-35 TR	36-40 TR	46-50 TR	56-60 TR	66-70 TR	71-75 TR	76-80 TR	81-85 TR	86-90 TR	96-100 TR
0- 1,000	0-1				1-0											
1,100- 2,000																
2,100- 3,000	1-0	0-1				1-0										
3,100- 4,000		0-1														
4,100- 5,000		2-2			1-0	0-1			1-0				1-0			
5,100- 7,500	3-0	1-1	1-0	1-0		1-0										1-1
7,600- 10,000			1-1		1-0							0-1	1-0			
10,100- 15,000	1-2	2-0							3-0		1-0				1-1	
15,100- 20,000	0-1	1-1							1-0		1-0	1-0				1-1
20,100- 25,000	1-0		0-2					0-1		1-0	2-0					1-1
25,100- 30,000	1-1	0-1			1-0							1-0			1-0	
30,100- 35,000		1-0							1-1							
35,100- 40,000																
40,100- 50,000		2-1	1-1	2-0	1-0	0-1			0-1				1-0			
50,100- 60,000	0-1	3-0		0-1					1-0							
60,100- 70,000																
70,100- 80,000		1-0	1-0													
80,100- 90,000		1-1		1-0												
90,100-100,000	1-0		1-1						1-0							
100,100-120,000	1-0	0-1	0-1				1-0									
120,100-140,000	1-0		1-1											0-1		1-0
140,100-160,000																
160,100-180,000			1-1													
180,100-200,000	1-1															

T—Turnaround. R—Routine.

FOG FROM CONVENTIONAL induced-draft cooling tower with air leaving stacks at 42 ft. above ground. Fog blankets ground on lee side of tower causing nuisance due to reduced visibility. Fig. 1.

How to keep UPKEEP DOWN!

Know your Cooling Towers

. . . and how to keep them at top efficiency

Here's what the author discusses

- Cooling towers are essentially heat exchangers transferring heat from water to air. The mechanics and theory of cooling are reviewed here.
- Problems of icing and fogging in cold weather are discussed with these suggestions for alleviation: (1) raising temperature level of the circulating water, (2) shutting down outer row of spray nozzles, (3) pass more air through tower, (4) install high stacks.
- The need for frequent inspection of the entire tower to learn of malfunctioning of any part of the tower—structure or mechanical equipment—is emphasized. Prompt attention to maintenance and correction of any malfunctioning is stressed, together with suggestions for inspection and maintenance. Deterioration of cooling-tower wood is discussed and the various methods of control.
- Prompt and proper maintenance will keep a cooling tower functioning efficiently and prolong the useful life of a tower, in the long run saving money.

By Lester M. Ferguson

WITH the increasing demands for industrial cooling water, the growing scarcity of suitable cooling-water supplies, and increased agitation for water-pollution abatement, cooling towers are being used more and more to solve industrial-cooling-water-supply problems.

1. Evaporative cooling

A cooling tower is essentially a heat exchanger, heat being exchanged from water to air. Unlike the conventional heat exchanger, the heat removed from the water is principally in the form of latent rather than sensible heat. Latent heat is removed from the water by evaporating some of the water. Each pound of water evaporated removes roughly 1,000 B.t.u. from the remaining water.

Cooling ponds and spray pond . . . Evaporation of water from the surface of a pond will remove heat from the pond water. Evaporation will be accelerated by air movement. If the water is sprayed into the air above the pond, thereby exposing more water surface to the air, more rapid evaporation will take place.

Atmospheric cooling towers . . . The first cooling towers were of the atmospheric type. With this type, the water cascaded over wooden slats which, by successively breaking, agglomerating, and breaking the water into more drops and ever-changing surfaces, promoted a higher evaporation rate resulting in

faster cooling. As with the spray pond, rate of evaporation increased with the velocity of the wind. However, though cooling was hastened, high wind velocities carried away a spray of water resulting in an economic loss (especially if the water had been treated) and created a nuisance.

Mechanical draft . . . In order to overcome erratic cooling due to vagaries of the wind, the mechanical draft cooling tower was developed. By controlling the quantity of air through the tower, more consistent cooling was obtained.

Forced draft . . . The first mechanical-draft towers were the forced-draft type. Air was blown into the tower through openings in the sides, passed through the tower countercurrent to the water, and left at the top—the entire top being open for discharge of the air. The exit velocity of the air was quite low. The forced-draft tower was an improvement over the atmospheric tower but had a serious fault. Wind blowing over the tower, especially crosswise, created a negative pressure on the lee side of the tower. Moisture-laden air from the tower was blown to the lee side, dropped down off the tower, and was picked up by the fans and forced into the tower again. This recirculation of moist air seriously lowered the efficiency of the forced-draft tower.

Induced draft . . . To overcome recirculation, the induced-draft tower was developed. With this type, air enters a large area in the sides of the tower, passes through the tower countercurrent to the water, and is picked up by the fans at the top of the tower and forced out through a stack of relatively small diameter at a relatively high velocity. This velocity tends to carry the air up and out of the air stream entering the tower, thereby reducing recirculation.

Mechanics of Cooling

In order to remove a certain amount of heat from a given amount of water by means of a cooling tower, a definite amount of water must be evaporated. A mechanical-draft cooling tower is a device which passes water and air through the structure in such manner as to increase the rate of evaporation of the water, the air picking up the heat and carrying it from the tower. A tower manufacturer aims to pass as much air and water through his tower as possible, and at the same time maintain even distribution of both water and air over the entire area of the tower, break the water into small drops in order to present the largest amount of water surface to the air, and keep power requirements for moving air through the tower at a minimum.

Compact vs. open fill . . . If fill is installed that is compact and efficient from the standpoint of water distribution, wetted surface and breakup, air resistance through the tower is high and fan-power requirements are high. In order to keep fan horsepower low with the same amount of air through the tower, the fill must be more open. Then, in order to get the same amount of cooling, more fill (wetted surface) must be added which means either increasing the height or increasing the area of the tower to accommodate additional fill.

As with most engineering design, a compromise is made. Each manufacturer has his own method for obtaining optimum cooling for the least structure and the least pumping and fan-power requirements.

Theory of Cooling

As mentioned earlier, a cooling tower cools water by evaporating some of the water. For water to evaporate, the water itself must have a higher vapor pressure than that of the water in the ambient air. The vapor pressures vary with the temperatures. When the water is warmer than the wet-bulb temperature of the ambient air, water will evaporate into the air transferring heat. With a given water temperature, evaporation increases with a decrease in wet-bulb temperature.

In transferring heat from water to air by means of a cooling tower, there must be a difference in heat potential between the water and the air. The temperature of the water to be cooled is generally dictated by plant operations and, to some extent, can be controlled.

Selecting wet-bulb temperature . . . This is determined from records of wet-bulb

FOG PATTERN from standard induced-draft cooling tower with stack 120 ft. above ground. Fog forms but dissipates before reaching ground, avoiding nuisance. Fig. 2.

THE AUTHOR

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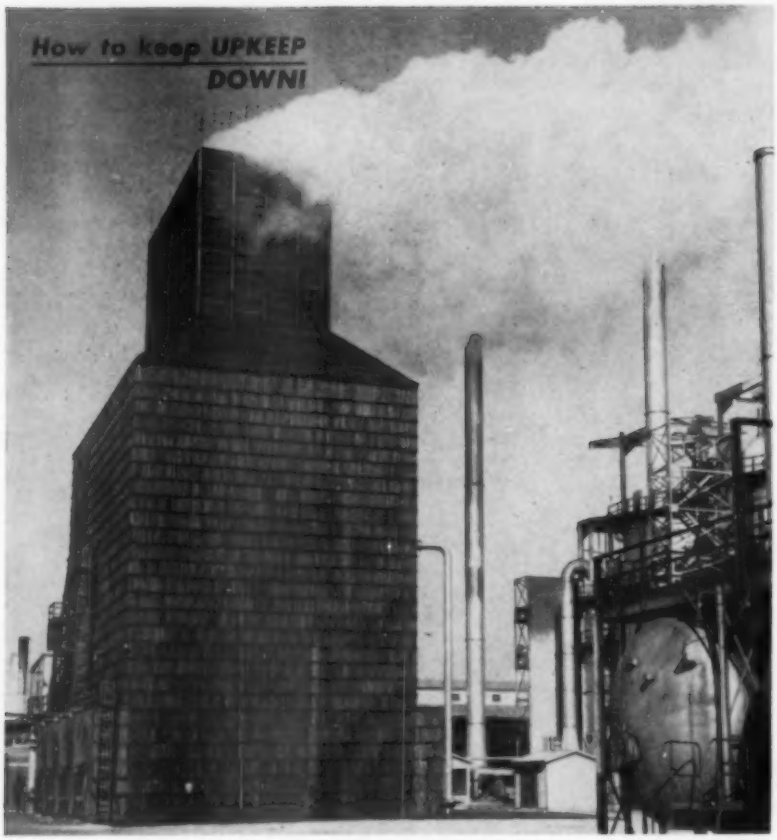


SPECIAL FORCED-DRAFT TOWER exhausting air 120 ft. above ground. Note how fog plume disappears without causing nuisance. Fig. 3.

temperatures observed in past years at the particular location. This wet-bulb temperature is a part of weather and, like the weather, little can be done about it. It is general practice to select a wet-bulb temperature that will be exceeded not more than 5 per cent of the time during the months of June, July, August, and September. With such a wet-bulb temperature, a tower should deliver cold water at design temperature more than 98 per cent of the time. Therefore, there may be several hours at a time throughout the summer months when a cooling tower will not deliver water as low as the design cold-water temperature. If a higher wet-bulb temperature is selected, a larger tower will be required and the user usually is penalized by paying capital and power costs out of proportion to the benefits obtained.

Driving force . . . When considering the exchange of heat in a cooling tower, it is postulated that each particle of water to be cooled is surrounded by a film of saturated air at the temperature of the water particle. The heat exchange is due to the potential difference, or driving force, between the heat content of the air film surrounding the water particle and the heat content of air passing through the tower at any particular point in the tower. Thus, the amount of heat lost by the water is the difference in enthalpy of the air film surrounding the water particle at its particular temperature, and the enthalpy of the air passing through the tower at its wet-bulb temperature at the point of contacting the air film.

This can be illustrated by referring to Table 1. The table shows the enthalpy of air at various wet-bulb temperatures. The wet-bulb temperature in Column 1 may be taken as the temperature of the air passing through the tower, the corresponding enthalpy being shown in Column 2. The temperature in Column 3 may be taken as the wet-bulb temperature of the air film surrounding a water particle, the corresponding enthalpy being shown in Column 4. Horizontally is shown the enthalpy of air and water at different temperature levels, each with 10° F. temperature differences. The last column shows the difference in enthalpy at the different temperature levels.

Air at 30° F. wet bulb has an enthalpy of 10.92 B.t.u./lb. of dry air. A film of saturated air surrounding a particle of water at a temperature of 40° F. has an enthalpy of 15.23 B.t.u./lb. of dry air. If 30° and 40° air contact (a 10° temperature difference), there is a heat-transfer potential of 4.31 B.t.u./lb. of dry air. If the air temperature is 80° F. and the water temperature is 90° F. (again a 10° temperature difference), the heat-transfer potential is 12.24 B.t.u./lb. of dry air. The higher the temperature level, the greater the heat-transfer potential and the greater the ability of air to pick up heat from the water. This can be noted from the last column of Table 1. This column shows that the heat-transfer potential is not proportional to the wet-bulb temperature. The heat-transfer potential at the 80°-90° range is almost three times that at the 30°-40° range. This accounts for cooling towers operating more effective at high water temperatures.

It is also interesting to note that although ambient air contains both sensible and latent heat in various ratios, the total heat content of air is constant for a given wet-bulb temperature regardless of the variation of the sensible-latent heat ratio.

This is shown in Table 2. The table shows the ratios of sensible to latent heat in a pound of dry air at 75° wet-bulb temperature and various dry-bulb temperatures.

TABLE 1—ENTHALPY OF MOIST AIR

Entering air w.b. temp., °F.	Enthalpy of entering air, B.t.u./lb. dry air	Air film and tower water temp., °F.	Enthalpy of air film at tower water temp., B.t.u./lb. dry air	Enthalpy difference, B.t.u./lb. dry air
80	43.69	90	55.93	12.24
70	34.09	80	43.69	9.60
60	26.46	70	34.09	7.63
50	20.30	60	26.46	6.16
40	15.23	50	20.30	5.07
30	10.92	40	15.23	4.31

TABLE 2—SENSIBLE-LATENT ENTHALPY RATIO OF MOIST AIR

Air temp., °F.		Enthalpy, B.t.u./lb. dry air		
Wet bulb	Dry bulb	Sensible	Latent	Total
75	75	18.02	20.59	38.61
75	85	20.42	18.19	38.61
75	95	22.83	15.78	38.61
75	105	25.23	13.38	38.61
75	115	27.64	10.97	38.61

When stating the operating conditions under which a cooling tower is expected

COMPARISON OF FOG from special forced-draft tower exhausting at 120 ft. (foreground) and standard induced-draft tower exhausting at 42 ft. height in background. Fig. 4.

to operate, the wet-bulb temperature of the ambient air is specified and the dry-bulb temperature is ignored. The dry-bulb temperature of the air, as such, has no significance in either the design or operation of a cooling tower.

2. Cooling-tower operational problems

Icing . . . Although cooling towers, in most cases, satisfactorily remove the waste heat from process cooling water so that it can be reused, cooling towers present nuisance and maintenance problems unlike those of most other pieces of refinery equipment. One nuisance problem is that of icing in cold climates. Icicles on the outside of a tower due to casing leaks are potential hazards to personnel and equipment. Ice on fill and louvers may damage these parts, and on forced-draft towers falling ice may damage fans. Ice tends to form where cold air enters a tower and, in extreme cases, icing may completely shut off entrance of air into a tower.

Water leaks . . . Icicles due to water leaks through the tower casing are the result of lack of maintenance. Redwood, although a relatively stable wood dimensionally, will swell, shrink, warp, and twist. A cooling tower is not a rigid structure. It will weave and twist with winds, and induced-draft towers will transmit vibrations from fan equipment throughout the tower, tending to loosen the members. A few boards, a little nailing, and caulking will eliminate water leaks.

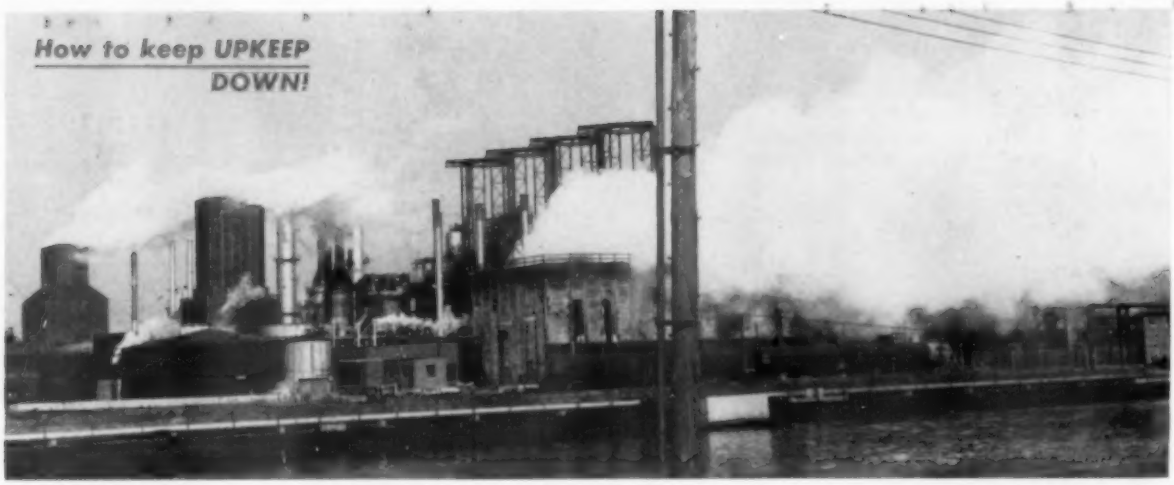
Ice on louvers . . . This is usually the result of faulty construction or maintenance. Louvers are intended to pass and distribute air into a tower. They are not intended to catch, deflect, and shed falling water. A tower should not be accepted from a manufacturer until it is assured that falling water will not strike the louvers. If this condition is attained, subsequent maintenance will assure this condition.

Icing of the fill . . . This is simply the result of too cold a water. Almost invariably cold-water temperatures are maintained much lower in winter than the design cold-water temperature. Then, with the same heat load, the hot water returned to the tower is at a lower temperature. This increases the icing tendency. There is little justification for maintaining cold water temperatures 20° or 25° lower in winter than in summer.

Raising circulating-water temperature . . . The tendency for ice to form on the fill may be reduced by raising the temperature level of the circulating water by concentrating the water through some of the cells, shutting down the remaining cells. The temperature may be raised further by reducing the quantity of water circulated. The same result may be attained by reducing the amount of air passed through the tower. This may be accomplished by shutting down fans or by running the fans at half speed. The latter is preferred.

Shut down outer row spray nozzles . . . Ice tends to form first on the louver face of the fill where cold air enters the tower. This tendency may be reduced by shutting down the outer row of spray nozzles, concentrating the warm water farther back in the tower away from the outer face of the fill.

Reverse fans . . . If ice does form in the tower, it may be melted by reversing the fans or by circulating water



MORE COMPARISON of fog from low-stack tower (center foreground) with fog from high-stack cooling towers in left background. Fig. 5.

over all the cells, running every other fan. If the icing is not too severe, the warm water will melt the ice in the cells with the idle fans. When the cells with the operating fans ice up, the procedure is reversed. This procedure has been quite effective in reducing the ice problem with forced-draft towers. It does, however, require vigilance on the part of the operators.

Fog

Fog from cooling towers is another nuisance problem which, at times, has been quite serious. Fog usually forms during periods of low ambient temperatures, and especially when the relative humidity is high. Fog from a cooling tower is the result of warm, heavily moisture-laden air being discharged into cooler ambient air which lacks capacity for absorbing the resulting excess moisture as vapor. The excess moisture condenses as fog.

As warm air is lighter than cold air, it would seem that the warm air from a cooling tower would rise. This is true of dry air. But the warm air from a cooling tower, being nearly saturated with water, is heavier than the colder ambient air due to the greater amount of water in the warm air. Thus, the moisture-laden air becomes supersaturated on contact with the cooler ambient air, the excess moisture condenses to fog, and sinks to the ground. At times this fog may blanket the entire area on the lee side of a tower, reducing visibility. Fig. 1 shows typical fog from a conventional 46,000-g.p.m., 18-fan standard-type induced-draft cooling tower, with air leaving stacks 42 ft. above the ground.

Pass more air . . . Formation of fog can be reduced by passing more air through a tower, thereby lowering the exit temperature of the moisture-laden air and reducing the amount of water in each pound of air. This may not always be practical because many times during periods of fogging, ambient-air temperatures are such that excess air will accelerate icing.

High stacks—120 ft. . . . If sufficient ambient air is mixed with the air from the tower so that the resulting mixture contains all the moisture, and the resulting temperature is above the dew point, fog will be prevented. This condition has been approached at Sinclair's East Chicago refinery by installing cooling towers with stacks terminating 120 ft. above the ground.

In 1951, this East Chicago refinery installed an 11,000-g.p.m. four-fan standard-type induced-draft counterflow cooling tower with a 36 by 36-ft. stack extending 120 ft. above the ground. Fig. 2 shows the fog pattern from this tower. While fog is not altogether prevented from forming, sufficient dispersion is effected so that fog is dissipated before it reaches the ground and nuisance is avoided.

Fig. 3 shows a 16,500-g.p.m., eight-fan special forced-draft counterflow cooling tower exhausting air 120 ft. above the ground. This tower was placed in operation early in 1954 to serve a catalytic reforming unit. The photograph shows the typical fog plume which disappears without causing nuisance.

Fig. 4 shows a 23,000-g.p.m., 12-fan special forced-draft counterflow cooling tower, again exhausting air 120 ft. above the ground. This tower went into operation late in 1955 in conjunction with a fluid catalytic cracking unit. The photograph shows the fog from this tower well above the ground. In the background can be seen fog from a standard induced-draft tower which discharges air from about 42 ft. above the ground. Fog hugs the ground reducing visibility to zero on the lee side of this tower.

Fig. 5 shows the same 46,000-g.p.m. low-stack tower shown in Fig. 1, with the high-stack towers shown in Figs. 2 and 3 in the background. The effectiveness of high-stack towers in reducing fog nuisance can be judged from the patterns of the fog plumes from these towers.

Operation of high stack towers at East Chicago has demonstrated that by exhausting the air from cooling towers 120 ft. aboveground, sufficient ambient air mixes with the vapor to disperse the fog before it can reach the ground and create a nuisance.

3. Maintenance

The economic life of a cooling tower depends primarily upon maintenance. Inattention and neglect of small maintenance jobs may result in inefficient cooling at the time and extensive and expensive repairs later. The environment in which cooling towers operate creates problems of corrosion and decay not usually encountered by other pieces of refinery equipment. This fact must be realized and accepted. Prompt and proper maintenance is necessary for satisfactory operation and long life, and prompt maintenance will result in lower over-all maintenance charges over the life of a tower.

Industrial cooling towers are constructed principally of wood fastened together with nails and bolts. The entire structure is subjected to inclemencies of the weather; warm, moist atmosphere inherent in their operation; and vibration from mechanical equipment. Parts of the tower are exposed to water ranging from hot to cold; some parts are exposed to a warm, humid atmosphere; while other parts remain substantially dry. The water usually contains water-treatment chemi-

cals, contaminants from leaking heat-exchange equipment, and air and water-borne bacteria and spores of fungi, which are transferred to the tower structure.

The tower electrical and mechanical equipment on the top of induced-draft towers is subject to particularly corrosive conditions of heat and humidity.

Vapor recirculation . . . High-stack cooling towers not only eliminate fog—they eliminate vapor recirculation. If vapor recirculation is eliminated, the forced-draft method of air circulation can be employed to gain the advantage of reduced metchanical and electrical maintenance inherent in the forced - draft tower.

Painting . . . Exposed surfaces of mechanical equipment, electric motors, and conduit should be painted as often as necessary to protect the metal. Metal coatings such as galvanizing, parkerizing, etc., should not be relied upon for protection, as these coatings do not seem to last long in refinery atmospheres. Plastic and plastic-coated electric conduit has shown promise in some installations. Polyvinyl chloride and polyethylene-wrapped electric cable has shown promise of combating corrosion in cooling-tower service.

Motors . . . Idle fan motors should be run at least once a week and brought up to operating temperature to keep the interiors of the motors dry. In some cases it may be advisable to install heating coils in the motors to keep moisture out of the motors when idle.

Mechanical equipment . . . The entire tower should be inspected daily and checked for unusual noise and vibration—almost always traced to mechanical equipment. The cause of excessive noise or vibration should be corrected immediately.

Mechanical equipment should be checked monthly for loose bolts. Any found should be tightened to preserve alignment and reduce vibration. Gears should be checked monthly for excessive wear of bearings, shafts, and gears, promptly replacing worn parts as may be necessary. Drive shafts should also be checked at this time for alignment and for wear of couplings or joints.

Fans . . . These should be checked for wear and corrosion which may throw them out of balance and cause excess vibration. The setting of fan-blade pitch should be checked if excessive vibration develops.

Lubrication . . . The oil in gear boxes should be checked weekly and oil added if necessary to maintain the proper oil level. If water or dirt is found in the gear box, the box should be drained and refilled with fresh oil. Oil in gear boxes should be changed seasonally—spring and fall.

Motor bearings should be checked at least monthly and lubricated when necessary.

Structure . . . Industrial cooling towers are generally constructed of redwood lumber. Redwood has good dimensional stability as woods go. Redwood has decay-resisting qualities due to natural extractives in the wood.

In spite of redwood's superiority over most other woods, wood is not the ideal material for cooling towers. Although it has good dimensional stability, fill, eliminator, and louver members do warp and twist and get out of place. Resistance to decay due to the natural extractives in the wood is not long lived in cooling-tower service. Continual flooding of the wood with water leaches the extractives from the wood and decay resistance is lost.

Other materials—metal, plastic, concrete, etc.—have been proposed for cooling towers but, so far, economics has dictated the continued use of wood.

The tower structure itself should receive as much maintenance care as the mechanical equipment—perhaps more. More money is invested in the tower structure than in the mechanical equipment. The entire tower should be carefully inspected twice a year — "summerized" in the spring to prepare the tower for its hot-weather cooling job, and "winterized" in the fall to prepare and protect it from the rigors of cold-weather operation.

It is important for efficient cooling that the distribution of air and water through the tower be uniform. The proper operation of the water-distribution system and the proper placement of fill and louvers will assure this.

At least once a year the accumulation of mud, algae, and other dirt should be flushed from the tower with a fire hose. Basin, cold and hot wells, etc., should also be cleaned.

After the tower is cleaned, all missing or misplaced louvers, fill and drift eliminators should be replaced. Bolts should be examined and any found loose should be tightened. The water-distribution system should be flushed and nozzles or splash plates adjusted or replaced as required.

4. Premature wood deterioration

At the same time, a thorough inspection of all lumber should be made for signs of premature wood decay. If any decay is discovered, steps should be taken immediately to kill the organisms responsible and prevent further infection and deterioration.

Remedies . . . Attrition generally is not severe unless the wood has been previously weakened by chemical or biological attack. Chemical attack can be prevented by maintaining the pH of the water within the 6.5 to 7.5 range and maintaining chlorine residuals below 1 p.p.m.

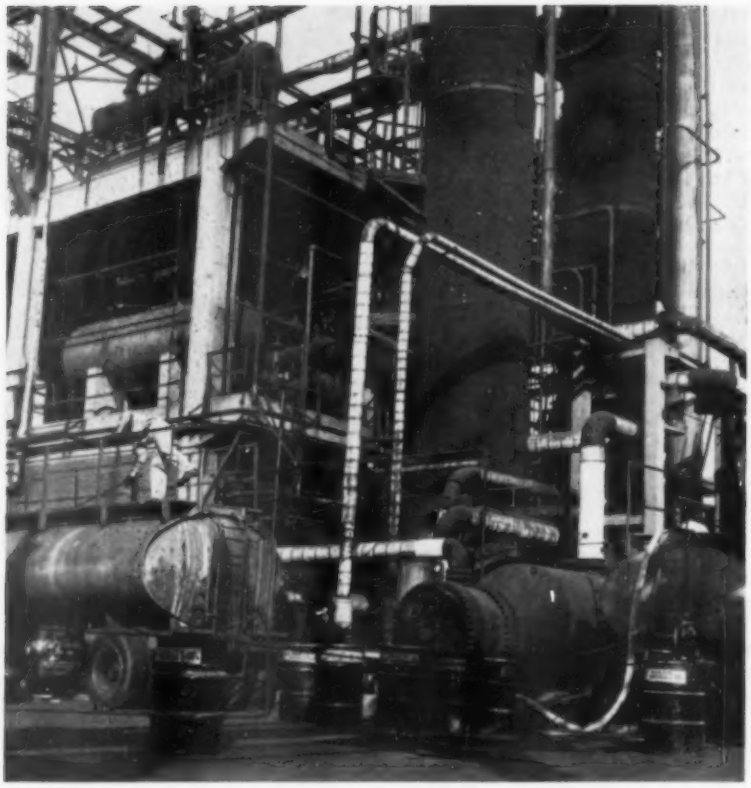
Fungicides . . . Microbiological attack can be prevented by either adding a fungicide to the water or by treating the wood directly with a fungicide. Most of the fungicides which are added to the water are intended as a shock treatment—a heavy dose of the fungicide is given for a short time to kill all biological life in the tower and water. Treatment is repeated when biological life reappears. Because of loss of fungicide due to blowdown, it is usually too costly to consider continuous treatment.

Most of the fungicides that are applied directly to the wood are oil or water soluble. Wet wood does not absorb oil solutions very well. As cooling towers can seldom be taken out of service long enough to completely dry the lumber, oil solutions are rarely used. Water-soluble fungicides may be used satisfactorily but such treatment should be considered a shock treatment. The water-soluble chemical is soon dissolved out of the wood by the circulating water, leaving the wood unprotected.

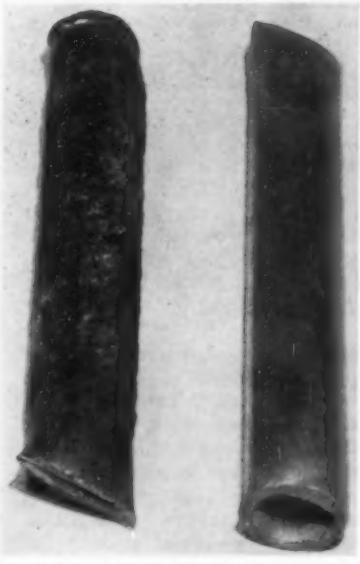
Double Diffusion Treatment

The most promising treatment of cooling-tower wood for inhibiting biological decay is the so-called double-diffusion treatment. This consists of applying a water-soluble solution of either zinc or copper sulfate to the wet wood, followed by drying. A water-soluble solution of sodium chromate is then applied, followed by drying, after which the tower may be placed in operation. The two chemicals combine to form a water-soluble zinc or copper chromate, either of which is toxic to fungi. The chemicals enter the cells of the wood and, being practically insoluble in water, are retained in the wood and are not readily leached out by the circulating water. Wet wood absorbs the chemicals more readily than dry wood, therefore, a tower need not be dried out before treatment as is the case with oil-soluble chemicals.

A badly deteriorated cooling tower in the Chicago area was treated by a double-diffusion method in March 1952. Four years later the chemical retention was reported good and no sign of biological activity was observed on the treated wood.



MOBIL SOLUTION TANKS are used to clean debutanizer, depropanizer, and absorber towers at an Ohio refinery.



BEFORE AND AFTER chemically cleaning sections of a heat exchanger tube with Oakite 88.

Six-year progress report on

Circulation Cleaning With Detergents

By A. T. Thibadeau

CLEANING by circulating specially designed detergents continues to save time for a large Louisiana refinery. The method was first introduced in 1951 for the cleaning of a depropanizer tower. It was used this spring to clean all five towers of the plant's C_4 vapor-recovery unit, at a saving this year of $2,355.76 in the cost of cleaning compound, and in the short time of 2½ days.

Detergent Cleanirg

The method of cleaning was established during preturnaround planning by the cleaning-compound manufacturer's representative and the refinery personnel. It began with analysis of the soil—a heavy, crusty deposit of oil, hydrogen sulfide, iron oxide, and cyanide. Then came the selection of a cleaning compound that would remove it. In 1951 the job was done with an acidic detergent that has excellent scale-removing properties even in the presence of oil. The third step was the circulation hookup and equipment for holding solution and pumping it through the tower.

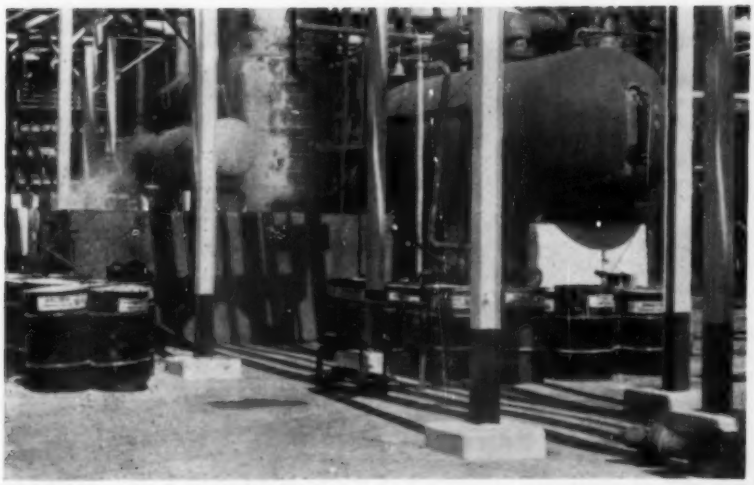
Plans, drawn up by the manufacturer's engineering department, were used in the construction of a steel tank, 6 by 6 by 18 ft., fabricated of ⅜-in. boiler plate. Six 1-in. steam coils, 16 ft. long, fastened to either side of the tank, provided heat for the solution. Suction lines, 6 in. in diameter, were installed in either end of the 4,800-gal. tank. Steam-turbine pumps capable of pumping 850 g.p.m. (with the discharge line connected to the 6-in. i.d. line running up the side of the tower) introduced the detergent solution into the top of the depropanizer. Solution passed down over the trays three-fourths of the way down the tower, then through the 14-in. line through the reboiler, back into the bottom of the tower and then back to the solution tank.

The solution tank was charged with a 16-oz. per gallon water solution of the acidic detergent, circulated at about 200 g.p.m., with the temperature kept at 200° F. for 12 hours, using the steam available in both reboiler and tower.

Cleaning was followed by rinsing the tower for 1½ hours with hot and 1 hour of cold water.

Results were excellent. The tower

Author is with Oakite Products, Inc., New York.



STATIONARY SOLUTION TANK is used to make up acidic detergent for pumping through towers during turnaround cleaning. This steam-heated vessel holds 4,800 gal.

was, for the first time, passed as gas-free without the considerable steaming that had previously been necessary. Metal inspectors and operations personnel both pronounced the tower ready to be put back on stream.

Results

Comparison of these results with those of former cleaning operations convinced the plant personnel that circulation cleaning with detergents designed for specific soils was the best answer. Manual cleaning had required 2 to 3 days of steam and washing to render the tower gas-free even before the men could go in to scrape deposits off the walls, trays, bubble caps, and downcomers. Cleaning, in 1950, with caustic followed by hot sulfuric acid, had not done a complete job. Refinery personnel had to finish it manually. The detergent circulation method did the cleaning satisfactorily in about 16 hours.

The following day the unit's absorber tower and six heat exchangers were cleaned with the same method and detergent. Circulation hookup was changed to permit cleaning first of the shell side of the exchangers, then the tube side, then into the tower, over the trays to the bottom, and back to the solution tank.

More on Method

Information gained during this initial operation and subsequent turnaround was put to good use by refinery personnel working closely with the manufacturer's representative. Premixing of the detergent solution, for instance, was facilitated by having the compound delivered in large drums, with space at the top to permit the addition of sufficient water to dissolve the compound, which could then be pumped directly into the 4,200-gal. solution tank. It was thus unnecessary to shovel or manually dump any of the cleaning compound.

Circulation too, was facilitated by using existing lines and product centrifugal turbine pumps. Instruments recorded temperature, and solution flow and levels, while strength of solution was determined by titration, using kits furnished by the manufacturers.

Success with the method over 3 years of operation led to the cleaning of two towers at a time. After cleaning, solution was not dumped but was then transferred to two other towers and circulated through them. Another solution tank, similar to the first, was made so two solutions could be made up simultaneously.

Two-Detergent Combination

At the same time, further studies and research by the manufacturer indicated that the soils in the towers would respond even more readily to a combination of two detergents, 16 oz. per gallon of the original acidic compound and 5 per cent by volume of a self-emulsifying solvent detergent designed to dissolve heavy oil deposits.

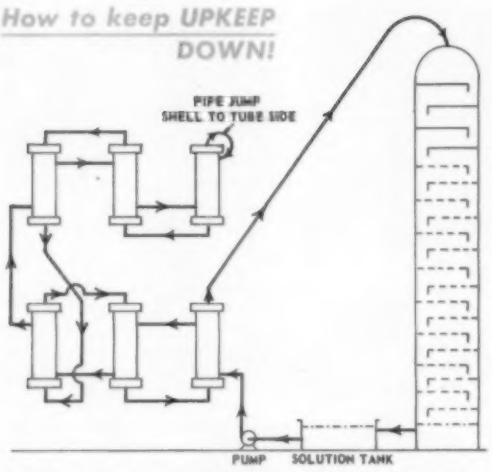
This solution was circulated through the deethanizer tower first, then transferred to the lean-oil still. Another batch, mixed in the second solution tank, was pumped through the depropanizer and into the rerun tower. Cleaning in all cases was continued for 12 hours, and rinsing for upwards of 4 hours followed. While the last two units were being cleaned, the deethanizer and depropanizer were rinsed. The fifth tower, the absorber, was then cleaned with a new solution of the acidic and solvent compounds, and that solution was dumped when cleaning had been completed.

Inhibited Detergent

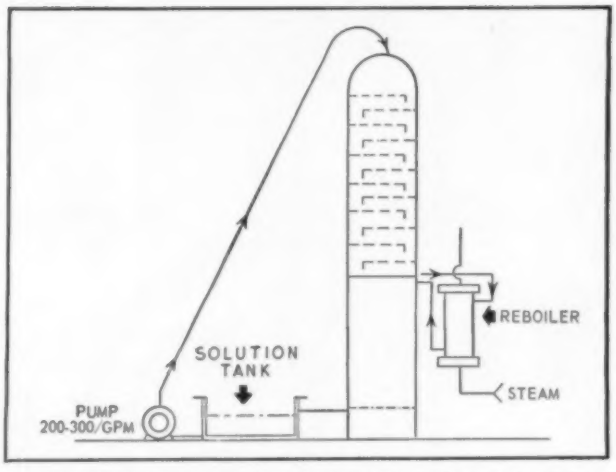
Results were good, but the compound manufacturer's representative was still not satisfied. When, in the spring of 1957, the deethanizer tower was to be cleaned before the installation of new stainless-steel trays, it was decided to test a new detergent compound which combined in one product both solvent and acidic properties. Developed specifically for the petroleum industry, the material is inhibited against attack on steel or iron, and has no adverse effect on synthetic-rubber gaskets or pump packing.

BEFORE AND AFTER chemically cleaning bubble caps. Oakite 88 was circulated through the tower with caps in place.

How to keep UPKEEP DOWN!



EXCHANGERS AND ABSORBERS are cleaned with the same solution in this hookup. Note circulation through both shells and tubes of exchangers.



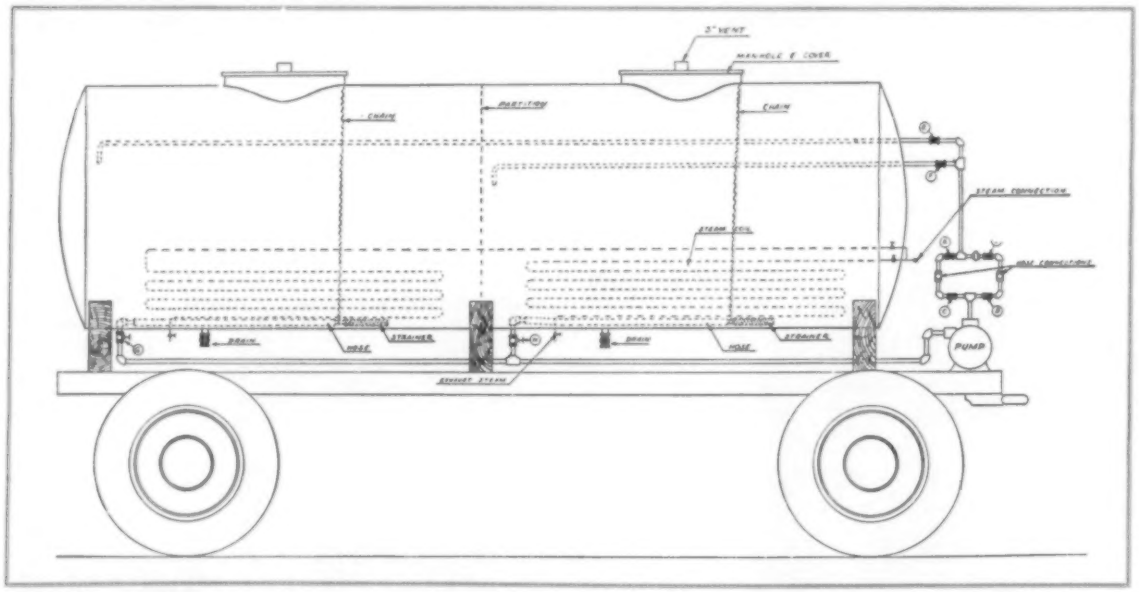
DEPROPANIZER TOWER AND REBOILER are cleaned in line with this chemical cleaning setup. Solution is circulated at a rate of 200 to 300 g.p.m.

The solution was made up at 20 per cent by volume with water, heated to 180° F., was circulated for 12 hours at approximately 360 g.p.m. Circulation started at 8:30 a.m. and solution strength dropped steadily until 5:00 p.m., when it leveled off at 10 per cent. Circulation was continued until 8:00 p.m., with no further drop in solution strength. The tower was then washed with water for 4 hours.

The tower was inspected and proved to be gas-free and very clean. Use of the new cleaning compound showed a saving of 31.4 per cent over the previous year's cleaning.

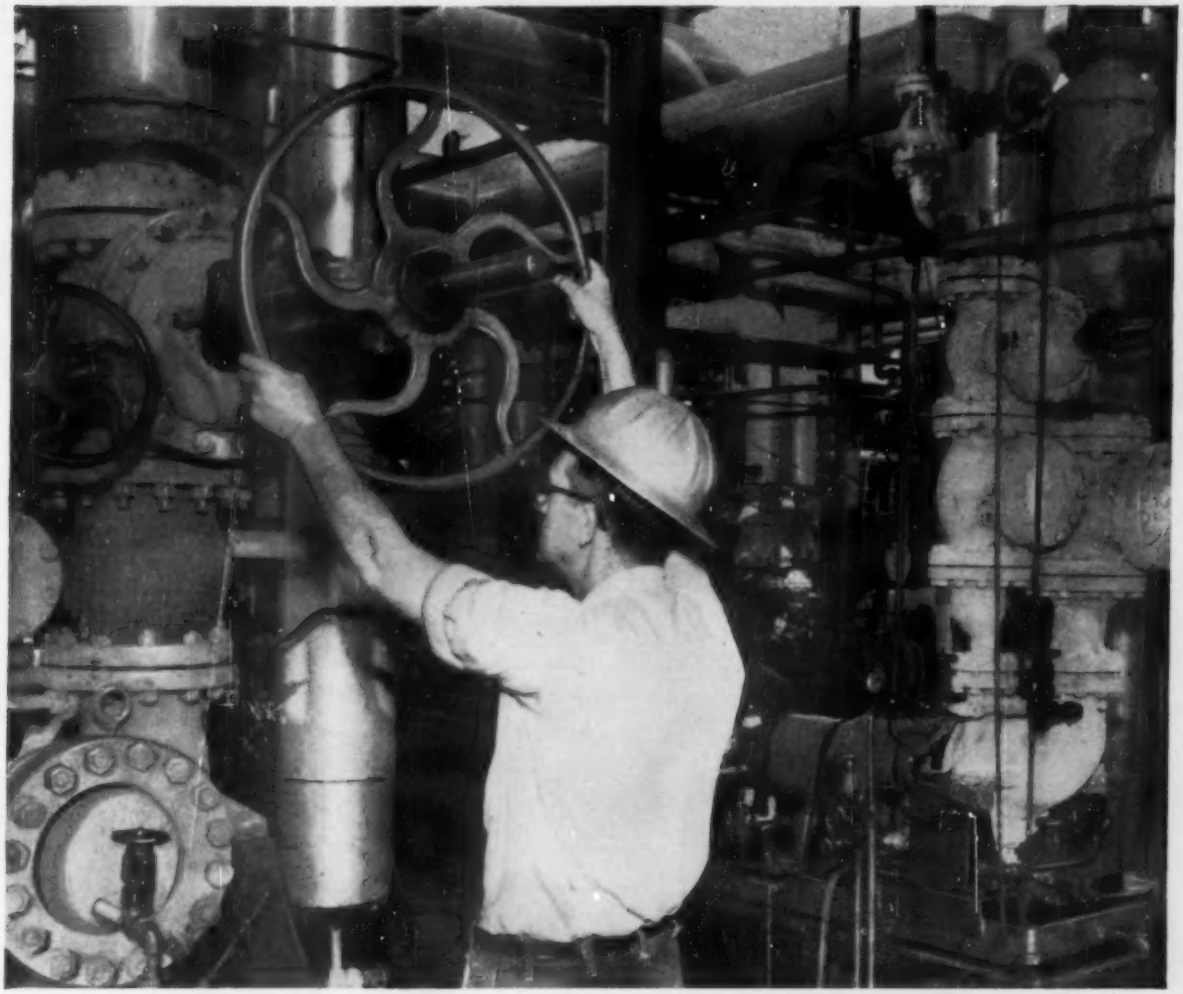
The other four towers of the gas-recovery unit were cleaned a week later with the combined solvent and acidic solution used in previous years. Results indicated that the newly formulated material, which had been used on the deethanizer tower, would do a better job on three of the other units as well. Plans have already been made to use it in the 1958 turnaround. Another newly developed material, with greater oil-penetrating properties, will be used to clean the absorber tower, where the oil deposits have always been heavier. At the post-turnaround critique, it was pointed out that air-agitation would have improved the rinsing, and that a centralized recirculating line hooked to all the towers would speed the cleaning.

The savings, first reported by this refinery in 1951 and continuing to the present, have been made possible by the close working relationship between the manufacturer's representative and petroleum field service manager on the one hand and refinery personnel on the other; by preturnaround briefing and diagraming of the circulation hookup; by the use of a convenient solution-tank installation and product lines and pumps for circulation; and the continuing work of the manufacturer's product development and service laboratory.



MOBILE SOLUTION TANK has many uses. This one has steam coils for heating the solution and strainers which prevent recirculation of solids.

Another Refinery Saves with Crane Steel Valves



14 years on 680° F. bottoms handling . . . still no repairs on these valves

These 300-pound Crane steel gates and checks were installed in The Cities Service Refinery Corporation at Lake Charles, Louisiana in 1943.

Installed in the "A" topping unit, on discharge line from bottoms pump, they're still leak-free . . . show no sign of seat damage.

For 14 years these valves have handled this tough 680° F. service with no more attention than routine maintenance at turnarounds. Once-a-week operation at this high temperature hasn't affected their original smooth and accurate seating action.

In Crane Exelloy, these valves have a highly developed seating material for handling hot oil and oil vapor. It has excellent resistance to corrosion, wear and temperature effects. Teamed with Crane steel castings, it assures durable valve service on recommended applications.

Get complete facts on Crane steel valves with Exelloy trim from your Crane Representative, or write to address below.

IDEAS FOR YOU in this book of "Valve Performance Facts." Your Crane Man has a copy for you.

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Ethyl research takes a new approach to match future fuels and engines

By H. J. GIBSON, Technical Director, Ethyl Corporation Research Laboratories

COMBUSTION characteristics of future gasolines in tomorrow's engines have been defined in an extensive study recently completed in the Detroit Research Laboratories of Ethyl Corporation. This project pursued these two basic objectives.

First, to find out how variations in hydrocarbon composition, sensitivity and other characteristics would affect the ability of gasolines to meet the fuel requirements of tomorrow's engines.

Second, to determine how future engines could be modified to permit effective use of the widest possible range of fuel characteristics.

Engine Adjustments Lower Octane Requirement

Three high-compression test engines were selected for their high volumetric efficiencies and because each represented a different philosophy of combustion-chamber design. Compression ratios were increased to 11-to-1, a ratio that can be expected in passenger car engines in the near future.

Each engine was completely calibrated on an engine dynamometer in order to assure realistic tailoring of the carburetion and ignition characteristics of the engine for the most effective use of commercial-type gasolines.

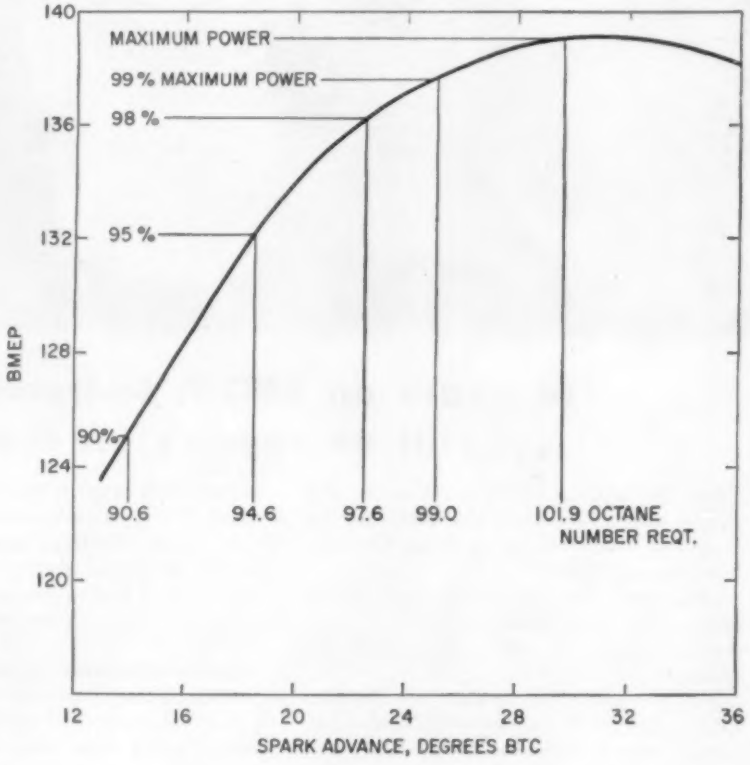
The engines were then installed in automobiles for road ratings of the fuels under test. Over one hundred commercial-type gasolines, including a wide variety of hydrocarbon compositions, were rated in these vehicles under carefully controlled conditions on a chassis dynamometer.

Results of the investigation indicate that a number of compromises can be made between engine performance and engine-fuel requirements.

For example, it was possible to lower the octane requirement with only nominal power loss and without significantly affecting fuel economy, by adopting slight modifications of spark advance and carburetor design.

It was further shown that it will be desirable for refiners to maximize the paraffinic and aromatic contents of their fuels in order to attain satisfactory operation at high engine speeds.

Low-cost olefinic blending components will continue to be effective in meeting the Research-octane-number specification required to satisfy the engine at low speeds.



This graph illustrates the relation between ignition timing and engine output for one engine at one speed. With ignition timing set for maximum power, the antiknock requirement is 101.9 octane number. When ignition timing is retarded to 99 per cent of maximum power, the octane requirement is reduced to 99. Thus, engine requirement can be reduced 2.9 octane numbers by sacrificing only one per cent in power.

Equation Predicts Road Octane Number

Using a digital computer, Ethyl statisticians analyzed the vast amount of data obtained from the tests. Extensive correlation equations were developed to aid refiners in blending their gasolines to the actual road antiknock requirements of current and future cars.

The best linear relation existing between road octane number and fuel-inspection data, such as Research and Motor octane numbers and hydrocarbon composition, was determined for each car.

Analysis of these equations showed Research and Motor octane numbers do a good job of defining road gasoline performance at low engine speeds.

At high speeds, however, consideration of gasoline composition, in addition to Research and Motor octane numbers, is useful in predicting gasoline antiknock performance. The correlation equations took the following form:

ROAD OCTANE NUMBER = A
+B *(Research Octane Number)*
±C *(Motor Octane Number)*
+D *(% Olefins)*

where A, B, C, and D are constants determined by analysis.

Additional properties, such as the volatility of the gasoline, do not materially enhance the degree of correlation.

Ethyl studies of the potential of future fuels and engines continue. The results will be distributed to oil companies. The data also will be discussed with automotive companies to acquaint them with the probable composition of future fuels as they may affect future engine design.

We believe such efforts will help to preserve a reasonable relationship between the advantages of high compression engines and their octane requirements.

In Ethyl's extensive road-rating program a digital computer was used to provide maximum statistical interpretation of the test data.

How Ethyl Research Is Helping You

Because of Ethyl's interest in the mutual problems of the petroleum refiner and automobile manufacturer, the extensive research program briefly described here was initiated to define the antiknock performance of future gasolines in tomorrow's engines.

This progress report is one more example of how Ethyl Research—outstanding in the study of engine-fuel relationships—continues to be of service to the petroleum industry.

Copies of the detailed report, "Matching Gasoline Antiknock Performance and Future Engines," presented at the May, 1957 meeting of the API Refining Division at Philadelphia, may be obtained from your Ethyl representative.

ETHYL CORPORATION
New York 17, N. Y.

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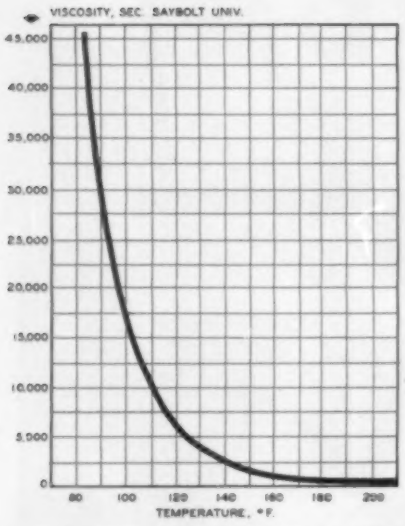
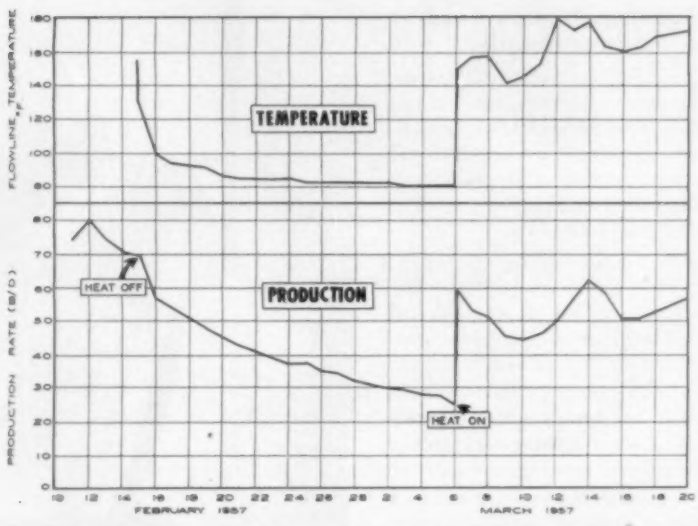


VISCOSITY-TEMPERATURE curve of 12.8° crude from Yorba Linda field. **Fig. 1.**



EFFECT OF HEAT on Yorba Linda crude production is evident here. Production dropped from 70 to 25 bbl. daily when heating was stopped. **Fig. 2.**

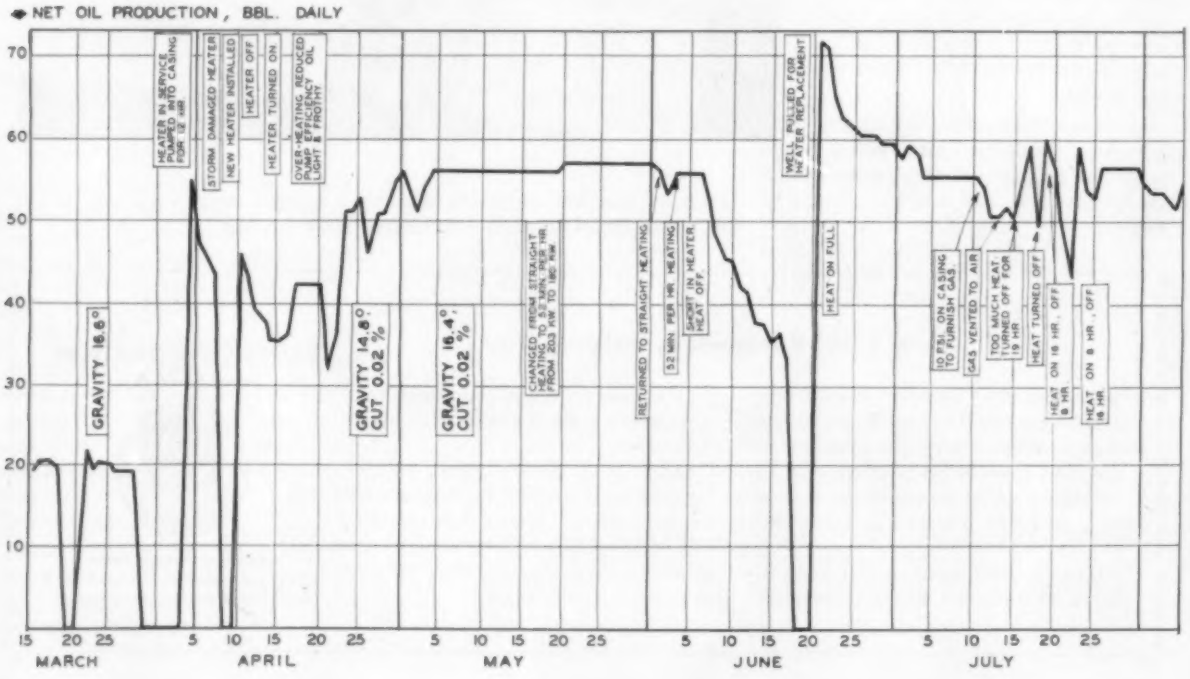
Bottom-Hole Heating Speeds Flow

BOTTOM - HOLE heating is slowly gaining acceptance in California fields as a tool for stimulating low-volume, heavy-oil producers, and for solving the plugging problem in wells plagued by wax deposition.

Heaters, either of the fluid circulating or electrical-resistance type, are now installed in some 750 wells. The majority are in low-gravity, semidepleted producers.

About 550 of these are in San Joaquin Valley fields. They also are widely used in Yorba Linda, Placerita, and in other fields near Los Angeles. They are beginning to find wider use in the low-gravity fields near Santa Maria.

Stepped-up production . . . For the most part they have stimulated oil production. They have resulted in an average production gain of about 10 bbl. daily in the instances where they



Part 1 of Two Parts

Bottom-hole heating of heavy-crude oil wells has increased oil production an average of 10 bbl. per day. Although a large amount of the increase is due to decreased oil viscosity, other factors are melting and preventing of wax and paraffinic deposits. Pumps operate more efficiently and costs of pumping are reduced.

By D. H. Stormont
District Editor

ALL CONTROLS and equipment for this circulating-type heater, installed at a Kern River well, are unitized into one package. Fig. 4.

# of Heavy California Oil

are successful. An increase of approximately 5 bbl. daily is needed for the average installation to be economical.

In some cases they failed to result in an economic increase. Why they are successful in some wells and fail in an offset is an unsolved question.

Large company users have set up certain requirements which must be met before heating is tried. The only sure way to determine whether a well will respond satisfactorily, however, is to install a unit.

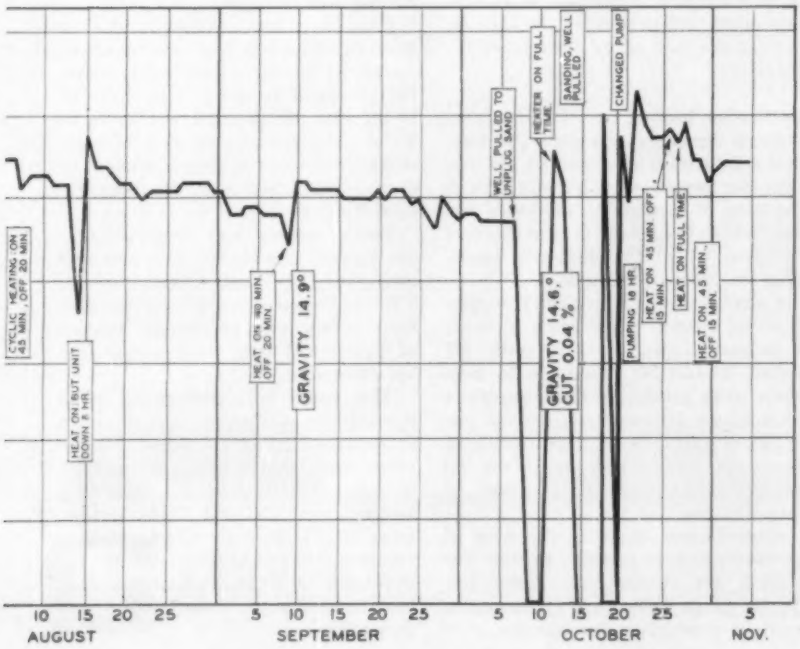
Theory of heating . . . In producing low-gravity wells the operator is continually faced with the problems of poor pump efficiency, liner slot plugging, and restricted fluid entry into the hole. Viscous drag in the pump and at the rod boxes limits pumping speeds.

High-viscosity crude causes a large pressure drop as the oil moves from the sand into the well bore. Flow is further constricted by the accumulation of asphaltic ends and wax on the external surface and slot peripheries of the liner. If the well is gravel-packed, these deposits also build up in the gravel.

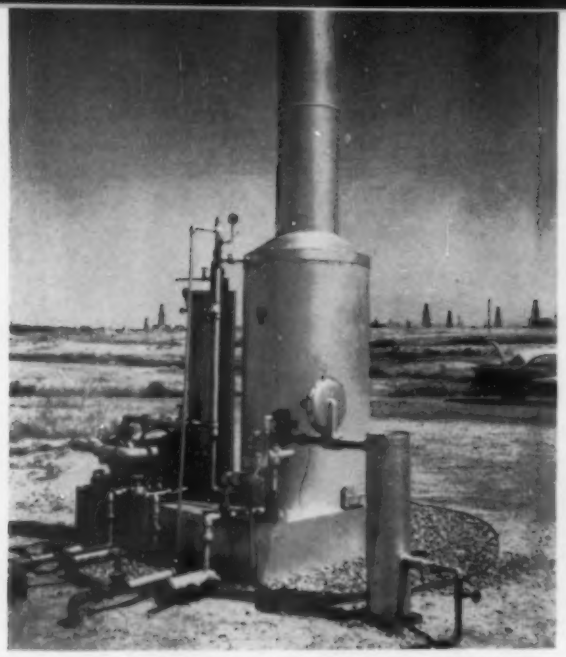
Where bottom-hole heating is used, the immediate effect is to lower the viscosity of the fluid. Also, it is theorized, heat should serve to reduce the effect of expansion cooling which occurs when the oil moves from the higher pressure sand into the well bore.

Factors . . . Several factors could determine the success or failure of down-the-hole heating. What the particular combinations of well and oil characteristics are that make the method successful in a given well can be only theorized. But the more important factors are:

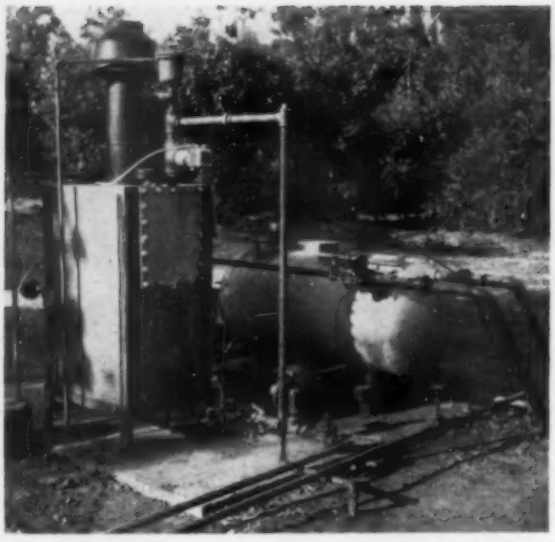
1. The viscosity-temperature relationship of the crude.
2. Bottom-hole temperature.
3. Per cent water cut.
4. Per cent sand produced.
5. Liner and formation plugging characteristics of the fluid.
6. Formation pressure.
7. Type well completion.


CYCLIC HEATING ON 45 MIN., OFF 20 MIN.
HEAT ON BUT UNIT DOWN 1 HR.
HEAT ON 90 MIN OFF 20 MIN
GRAVITY 14.9°
WELL PULLED TO UNPLUG SAND
HEATER ON FULL TIME
GRAVITY 14.6° CUT 0.04 %
SANDING, WELL PULLED
CHANGED PUMP
PUMPING 18 HR.
HEAT ON 45 MIN OFF 15 MIN
HEAT ON FULL TIME
HEAT ON 45 MIN. OFF 15 MIN.
10 15 20 25
AUGUST
5 10 15 20 25
SEPTEMBER
5 10 15 20 25
OCTOBER
5
NOV.

STUDIES at a Placerita well showed cyclic heating to be best. Final cycle chosen was 45 minutes on, 15 minutes off. Fig. 3.



CIRCULATING-TYPE HEATER in Midway-Sunset field supplies water at 220° F. to eight shallow wells. Temperature of return water is about 150° F. Fig. 5.



SMALL 175,000-B.t.u. per hour gas-fired heater used at 600-ft. wells in Yorba Linda field assists viscous-crude production. Fig. 6.

8. Thickness and characteristics of the oil sand.

Concerning the volume of oil production and per cent water cut, engineers of some large companies believe bottom-hole heating should be applied only where the unheated well has a gross output of less than 40 or 50 bbl. daily. The water cut should be less than 50 per cent, and percentage sand produced should be low. Another requirement is that the casing and liner should be in a satisfactory condition.

Change in viscosity . . . Most important factor, however, is the viscosity-temperature relationship. The crude should have a high viscosity at formation temperatures, with the viscosity curve dropping rapidly as temperatures increase.

Since viscosity normally increases with drop in gravity, one company uses the general rule that the crude should be less than 15° A.P.I. Another company, which has about 100 heaters installed, has adopted the rule-of-thumb that the viscosity-temperature ratio should be at least 5 to 1 before heating is attempted.

Crude produced from the 600-ft. zone at Yorba Linda offers a good example of the effect of heat on viscosity. The 12.8° crude has a viscosity of 45,000 S.U.s. at the reservoir temperature of 85° F. As is shown in Fig. 1, heating it to 145° F. results in the viscosity dropping to 2,200 S.U.s.

Effectiveness of bottom-hole heating appears to be directly related to the decrease in viscosity. But engineers are not too sure what actually causes the production increase. Some are inclined to believe it results solely from the increased mechanical efficiency of the pump; the higher temperature increases the mobility of the oil so that more oil moves into the pump between strokes.

The most widely accepted theory, however, is that heating also causes increased oil flow into the well bore. Raising the temperature of the well bore, and a certain limited amount of formation, eliminates the accumulation and deposition of waxes and asphaltic ends on the sand face and in the liner perforations. Thus not only is the heat beneficial in increasing pump efficiency but it also increases the rate of oil flow from the formation.

Formation heating . . . Other studies indicate heat is transmitted (by thermal conduction) a substantial distance into the formation.[1] Thus not only is the rate of production increased but the formation is made to give up more oil than would be ultimately recovered by primary methods.

Calculations made by Schild[2] suggest that the method might apply to other than low-volume, heavy-oil wells. He found it may be profitable to heat some wells producing large quantities of light oil. Effect of raising the reservoir temperature, he theorized, may have the same result as if the oil were produced through a well of larger radius.

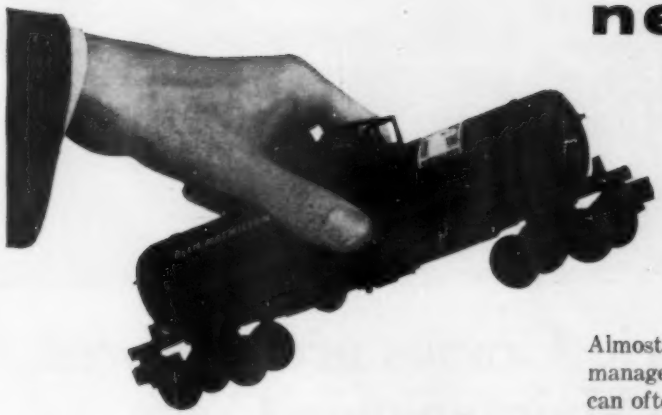
Observations made in the field as to how much is pushed into the formation are inconclusive. Some new Yorba Linda wells have continued to gain in production for months after the well was completed and heat applied. This would indicate heat was continually being pushed farther back into the formation.

Higher pump efficiency . . . Recent studies of one Yorba Linda well show the increased oil output caused by bottom-hole heating may be due principally to higher pump efficiency. As shown in Fig. 2, gross production dropped from 70 to 57 bbl. daily 24 hours after heating was stopped. It continued to drop at a slower rate during the next 18 days, and was down to a 25-bbl. daily rate when heating was renewed.

Flow-line temperatures declined more rapidly when heat was removed. As shown in the temperature curve, they dropped from 185° to 100° F. in the first 24 hours. It was down to 85° F. in 5 days. In the next 14 days, while production dropped from a 45 to a 25-bbl. daily rate, the temperature dropped only 6° F.

When heating was resumed, output jumped to a 60-bbl. daily rate and and the flow-line temperature to 150° F. within a matter of 6 hours—long before any substantial amount of heat could have been passed into the formation.

This could be construed to mean that effects of heating are confined to improved pump efficiency. On the other hand, output had climbed back to only 55 bbl. daily 14 days after heating was resumed. This decline from the 70-bbl. daily rate could have resulted from plugging during the shutdown. Or it could mean that more heat needed to be transferred to the formation.



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4682

Why Bucyrus-Erie Cranes are Tailored to Cut Your Maintenance Costs

Strength to handle loads smoothly and easily . . . ability to inch those loads accurately into place . . . extra large area clutches and brakes that take hold uniformly with a smooth firm grip — these are some of the features of Bucyrus-Erie 22-B and 38-B cranes that enable them to handle refinery maintenance at lowest possible cost.

Their box-section booms are fabricated by the most modern welding processes with light steel chord angles strongly laced to stand up under the compression and swinging stresses applied in fast crane operation. An independent boom hoist enables the operator to change boom angle at any point in the cycle . . . permits accurate positioning of loads. The big clutches and brakes are instantly responsive, smooth in action, provide utmost load-handling ability. Special disc-type boosters on the 38-B drum clutches give the operator minute control.

Add to these the optional features of variable multiple-part boom suspension (pendant-type for 22-B; mast and pendant-type for 38-B) for obtaining slower boom hoisting and lowering and greater accuracy of control, independent propel and third drum equipment for the 38-B, and you'll see why it will pay to have your plant Bucyrus-Erie equipped. Crane capacities (75% rating): 23,700 lbs. for the 22-B with 35-ft. boom at 12-ft. radius (27,000 lbs. for Heavy Duty 22-B); 49,000 lbs. for the 38-B with 45-ft. boom at 15-ft. radius. Larger capacity crawler cranes and 15- and 25-ton Transit Cranes also available. 314E56

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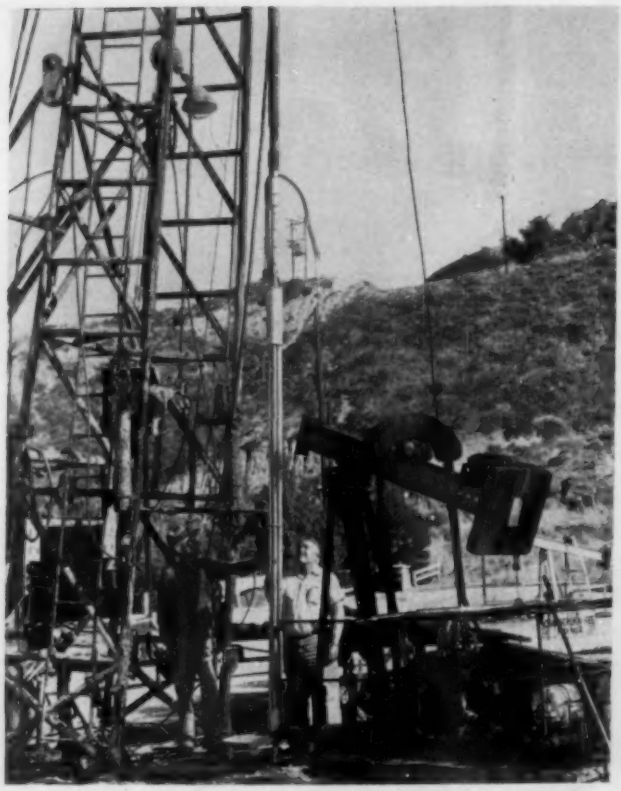
Bonus Quality Castings used in Bucyrus-Erie machines are produced in the company's own foundries where careful laboratory supervision holds them to the highest standards. Workmen are shown here pouring steel castings at the South Milwaukee Plant.

COPPER-CLAD CABLE being run in a Wilmington well prior to using electric heater for the low-gravity, viscous Tar zone crude. Fig. 7.



INSTALLING a 14-ft. electrical heater in which the heating elements are completely enclosed in individual steel pipes. Fig. 8.

Necessity for heating Yorba Linda crude is further borne out by well performance in numerous other occasions when heating was temporarily stopped for one reason or another. Within a matter of hours, output declined to about half the heated rate.

Bottom-hole temperatures . . . That temperatures can vary widely within a heated oil zone, depending upon permeability and composition of the intervals, is shown by a survey run in a Cymric well, westside San Joaquin Valley.

Bottom of the 30-ft., 70,000-B.t.u. electric heater was at 1,404 ft. A perforated nipple was set at 1,376 ft., immediately below the pump shoe. With the well producing clean 14° gravity crude at a 25-bbl. per day rate, the following temperatures were recorded:

Depth, ft.	Temperature, °F.
1,410	113
1,405	142
1,400	223
1,395	250
1,390	270
1,385	+270
1,380	+270
1,360	218
Above 1,360	153

Comparison of the temperature log with the electric log showed excellent correlation. The low temperatures tied in with oil sands; the high temperatures with shale breaks.

Altered connate water . . . There is some evidence that bottom-hole heating can alter the connate-water content of the pay section. One shallow San Joaquin Valley well was producing 5 bbl. daily of clean 14°-gravity crude. When heat was applied, gross production jumped to 12 bbl. daily. But it included a 4 per cent water cut.

After several weeks of production it was found that heating was not economically feasible. When the heater was pulled and the hole bailed, material removed from the well was found to be completely dehydrated shale. All moisture had been driven out. The well has since produced at a 5 bbl. daily rate, without a trace of water.

. . . How much heat should be used? So far as could be determined, little testing has been done to determine the optimum quantity required; i.e., the amount of heat over which an increase results in so little more oil that the cost of fuel exceeds the value of the increased oil production.

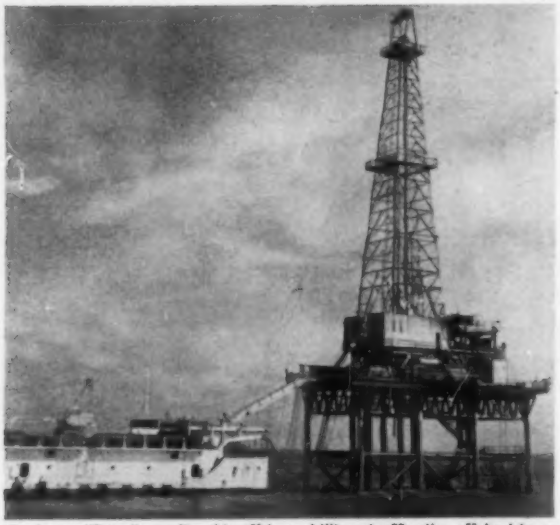
Undoubtedly the amount needed varies from well to well. But most heating is carried out on the basis of making sure that production is stimulated as much as possible. The amount used is not necessarily the optimum quantity.

Rate vs. heat . . . Studies made by Intex Oil Co. during a 216-day test period of an electric heater at a Placerita well show the effect of heating changes on rates of production (Fig. 3). The 70,000-B.t.u., 30-ft.-long heater was set at the bottom of the 2,064-2,322-ft. perforated interval.

Oil production responded immediately but after a few days declined. Overheating had made the oil so frothy that the pump could not efficiently handle it (see point 6 on graph). Straight heating was continued, however, for about a month.

When 52-minute per hour heating was tried (7), oil output rose from 57 to 58 bbl. daily. Return to straight heating caused a 1-bbl. drop (8), and reduction in heat input resulted in an added 3-bbl. decline (9). Other changes in production resulting from changes in the period of heating are shown in points 15 to 18.

Production dropped only slightly when 45-minute on, 15-minute off



The barge "Bates" supplies this offshore drilling rig 50 miles off Louisiana.

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Aeroquip Flexible Hose Lines on this hydraulic control panel are installed quickly.

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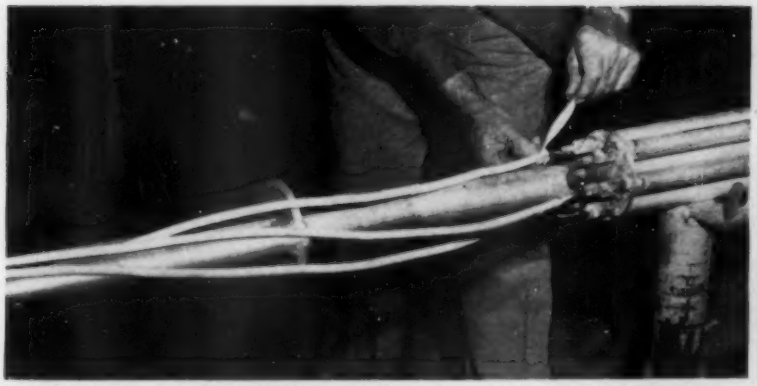

INSULATING the conductor leads to the heating elements of a three-phase heater prior to encasing the terminals in a water-tight housing. Fig. 9.

cycle heating was started in July (19). This method of heating appeared to be near the optimum, and after further testing (see points 21, 27, 28, and 29) this cycle was adopted. It was continued until sufficient heat had been pushed into the formation that a 30-minute cycle for 8 hours daily was sufficient.

During the 8-month test, despite the several days of lost production, oil output averaged 48 bbl. daily. This represented a 28-bbl. per day gain over the 20-bbl. rate it had produced during the month prior to the use of heat. The well's subsequent performance—which has been outstanding—is described later on.

Types of Heaters

Of the estimated 750 California wells being heated, almost 500 are of the hot-water circulating type. About 125 electric heaters are installed. Few hot-oil circulating systems are now in operation, and for that reason are not discussed here. Typical surface circulating-heater installations are shown in Figs. 4, 5, and 6. Figs. 7 and 8 show installations using electric heaters.

Which type is run quite often is determined by the availability of natural gas. Depending upon the comparative costs of electric power and gas, some studies show that circulating heaters are cheaper to install and operate up to well depths of about 2,500 ft. Below those depths, up-the-hole heat losses become such a factor that electric heaters may be more economical.

In low-volume wells where electric heaters are used, heat losses between the heater and the surface are such that flow-line temperatures are only 8° or 10° F. above those which exist when heat is not used. The crude may lose some 150° of heat in its trip to the surface.

At one Cymric well, maximum-temperature thermometer tests showed a bottom-hole temperature of about 270° F. while the well was producing at a rate of 25 bbl. daily. Flow-line temperature was 78° F.—about the same as that when no heat was used.

... Circulating heaters offered by the three principal manufacturers range in heat output from about 350,000 to more than 800,000 B.t.u. per hour. Most types now are packaged with a motor-driven water-circulating pump, gas scrubber, gas regulator, and makeup-water tank.

Safety controls shut down the heater to prevent overheating, or if either the fuel or electrical supply is interrupted. Some models use a pilot light with the safety features found in domestic hot-water heaters. (Fig. 5). Both closed and semiclosed systems are used so that little makeup water is needed as long as the circulating system is free of leaks.

Temperatures ranging from 180° to 350° F. are maintained at the heater outlet. Surface pipe of 1-in. size, or larger in multiple-well installations, is used to transport the hot water to the well. Usually ¾ or 1-in. macaroni strings, clamped to the tubing, are used to circulate water down the well.

Heat exchange at first was carried out in chambers 3 or 4 in. in diameter, and from about 20 to 300 ft. in length as sand thickness required. The trend now is to use shorter subsurface heaters. Likewise more and more finned tubing is being used because of the large amount of heat transfer surface offered.

Multiple-well installations likewise are becoming more popular. Where the wells are shallow and fairly close together, one surface unit may supply heat to as many as four, six, or eight wells. At such installations, heaters used are capable of circulating 35 or 40 g.p.m., as compared with 6 or 8 g.p.m. in single wells. By using multiple-well heaters, initial cost of the equipment is substantially reduced. A unit capable of heating six wells costs less than twice that for a single-well unit.

... Electric heaters are coming into wider use now that improved cables and heating elements are available. They have the advantage of being more adaptable to the heat needs of individual wells. By use of a time-cycle controller, the period of heating can be regulated to obtain maximum oil production. And since the heat can be used where it will do the most good, less energy is needed. The shorter subsurface heaters also generally permit fluid levels to be maintained lower.

High pressures encountered at the bottom of the hole has been a problem. This has been overcome by the use of sealed heating units. These prevent any contaminating material from coming in contact with the heating element and causing a short or ground.

Cable ... Another problem has been that of providing an electric cable capable of withstanding the mechanical abuse it must take as it is raised or lowered in the well. The cable must also not deteriorate while immersed in crude oil.

Using 440-480-volt, 3-phase current, power is transmitted to the heater by means of either copper or aluminum-clad cable, either mineral or fiber insulated. (Fig. 7). The cable is either strapped to the tubing or run inside 1-in. pipe. Tubing centralizers are run at intervals to keep the tubing from rubbing against the casing and causing a short.

Aluminum-clad cable sometimes is run in wells where hydrogen sulfide corrosion is a problem. It gives good service as long as the cable does not have to be pulled frequently. Overflexing, as the cable runs through the sheave, quite often results in ruptures.

Where corrosion is not a problem the copper-clad conductors give excellent service. The original cable run in a Placerita well in early 1952 is still in use. It has been pulled and rerun several times.

Polyvinyl chloride-covered cables are being more widely used. This is due to their lower cost and the fact they are available in longer lengths. The latter feature eliminates the many splices required when the 200-ft. lengths of heavy copper-clad conductor are used. In wells where the polyvinyl chloride cables are used, metal-clad conductor is run from the heater up to 100 ft. or more above the fluid level.

Some of the reduced splicing trouble is a result of greater care being

Picture courtesy Automobile Club of Buffalo, New York

The race was won, an era begun...

To the curious crowd, it was Thanksgiving Day, 1895. To the Duryea brothers, it was D-Day.

For this was the day they would compete in America's first automobile race, from Chicago to Evanston and back. A race that would see only six of over 80 entries able to start . . . and only two able to finish.

At 7½ miles per hour, the Duryeas' car didn't exactly sweep across the finish line as it won . . . but it did sweep away the last obstacles to the automotive era.

Nor was it merely the automobile age which the Duryeas ushered in. For, as thousands and then millions of automobiles took to the road, petroleum fell heir to the job of powering them. Oil became the nation's number one source of energy.

So it is that Cities Service, which has grown up with the automobile, now is faced with the biggest demand for its products in history . . . a demand heightened by the development of entirely new gasolenes now at Cities Service stations.

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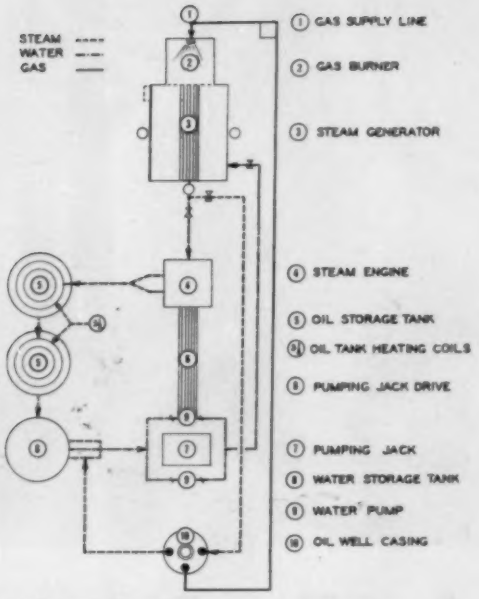
CITIES SERVICE

PROTOTYPE of a steam-driven pumping unit. Steam from the generator also would be used for bottom-hole heating. Fig. 10.



FLOW DIAGRAM of high-pressure steam shows it running the pumping unit, heating the well, and heating oil storage. Fig. 11.

taken. Principal reasons, however, are improved splicing techniques and better testing. Where metal-clad conductors are used, the area around the splice can be filled with magnesium oxide and the sleeve then clinched in place by applying 1,000-psi. pressure. To assure that the splice is leakproof under bottom-hole conditions it is hydrostatically tested at 1,500 psi.

Heating elements . . . Most heaters use Y-connected, ceramic-insulated elements (Fig. 9). In most types these are placed inside the heat exchanger, with oil produced either through the inner pipe or from around the heater. One manufacturer fills the space between the alloy-clad elements and the heater wall with a lead alloy to obtain better heat dissipation. As in the circulating type, some finned heat exchangers also are used to increase the heating surface.

Safety controls prevent the heater from operating while the pump is shut down. As a further precaution to overheating, newer heaters are designed so that the maximum temperature obtainable by continuous heating is about 350° F. Thus even if the pump fails there is no danger of carbonization.

Novel heating unit . . . Though not yet field tested, a novel unit especially designed for use with low-gravity crudes has been developed. It consists of a high-pressure, high-temperature generating unit which furnishes dry steam for both pumping the well, and for bottom-hole heating (Fig 10).

The gas-fired, water-tube generator is rated by its designer, J. H. Lawler, of Bell, Calif., as being capable of supplying 600 lb. per hour of 600-psi. steam at 675° F. The unit can furnish 300-psi. steam within 10 minutes after being fired up. Its gas consumption is lower than that of conventional units in bottom-hole heating, approximately 300 cu. ft. per hour. Feed water for the generator is supplied by a pump powered by the pumping jack on both the up and down strokes.

. . . Dry steam produced in the generator operates a high-torque, low-r.p.m. steam engine, without use of either a clutch or gear box. Through belts or chain drive the engine directly drives a conventional pumping jack. Pumping speeds are regulated by opening or closing a throttle valve in the steam supply line.

The two-cycle, single-action, V-type engine is rated at 20 hp. at 600 psi. The four cylinders have a 3⅞-in. bore, a 4¼-in. stroke, and exhaust at the top and bottom of each stroke. The engine is equipped with special rings, automatic oil level, and has a fully automatic condensate remover.

High-pressure steam likewise is made available for bottom-hole heating, as illustrated in Fig. 11. All condensate from the heater is returned to the water supply tank for reuse in the steam generator. Exhaust steam from the engine can be piped to wash or storage tanks and the waste heat utilized for crude dehydrating or tank heating. Condensate from the heating coils then can be returned to the water supply tank for reuse.

The unit shown in Fig. 10 is installed on a 25-ft. well at Lawler's Bell, Calif., shop. This unit uses 110-volt current in its operation but it can be operated from a 12-volt storage battery.

. . . Outside of California, bottom-hole heating likewise is on the increase. Principal purpose for heating is to keep wells free of paraffin deposits. Their greatest use for this purpose has been in the Panhandle area of Texas. There, severe waxing makes it necessary that some wells be periodically hot oiled, or other remedial measures used.

Principal Manufacturers

Most of the units installed in California fields were made by four manufacturers, one of which has over 600 in operation. The four firms are: Fran-Well Heater Co., Taft; Thermal Activators, Inc., Saugus; Oil Well Heating Systems, Inc., Los Angeles; and Curson Associates, Oakland.

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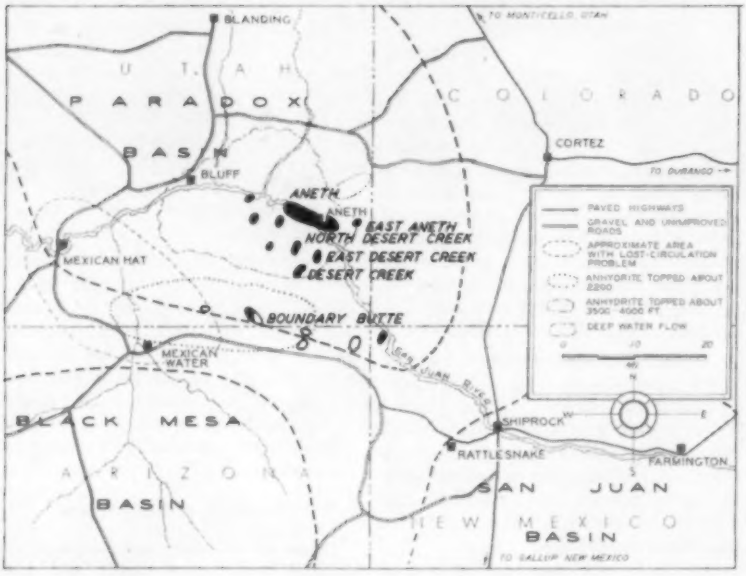
2. A. Schild, "A Theory for the Effect of Heating Oil Producing Wells," A.I.M.E. "Petroleum Transactions," Vol. 210, 1957, page 1.

Are You Planning to Drill



In the Aneth Area?

The Aneth area of the Paradox basin in the Four Corners area is one of the few bright spots in the drilling contractors' picture. All signs point to the need for more rigs and rapid development. This article tells the problems and procedures in today's drilling in the area.

By Ed McGhee
District Editor

CALVERT Drilling Co.'s Rig 20 is shown here drilling a well on a lease block that sold several months back for $3,102 per acre. Drilling time from spud to top of the Paradox was 22 days.

DRILLING contractors moving into the Paradox basin of the Four Corners area will find only one king-sized headache—transportation. Experience to date shows that cutting hole is much the same as in West Texas and Southeast New Mexico. And the driller can anticipate most of his problems before he spuds in in any given area.

As the map shows, there are no paved roads into the field. Nearest pavement lies no nearer than 30 miles and as far as 70 miles from some of the currently active spots in the basin. The few gravel roads that do go into the field are extremely rough, but they are passable except during rare wet spells.

$3,500 per location . . . In the field, cost of bulldozing a road and preparing a location ranges from $2,000 to $5,000 with the average around $3,500. Much of the ground is rough, strewn with rocks, and cut up by canyons and washes.

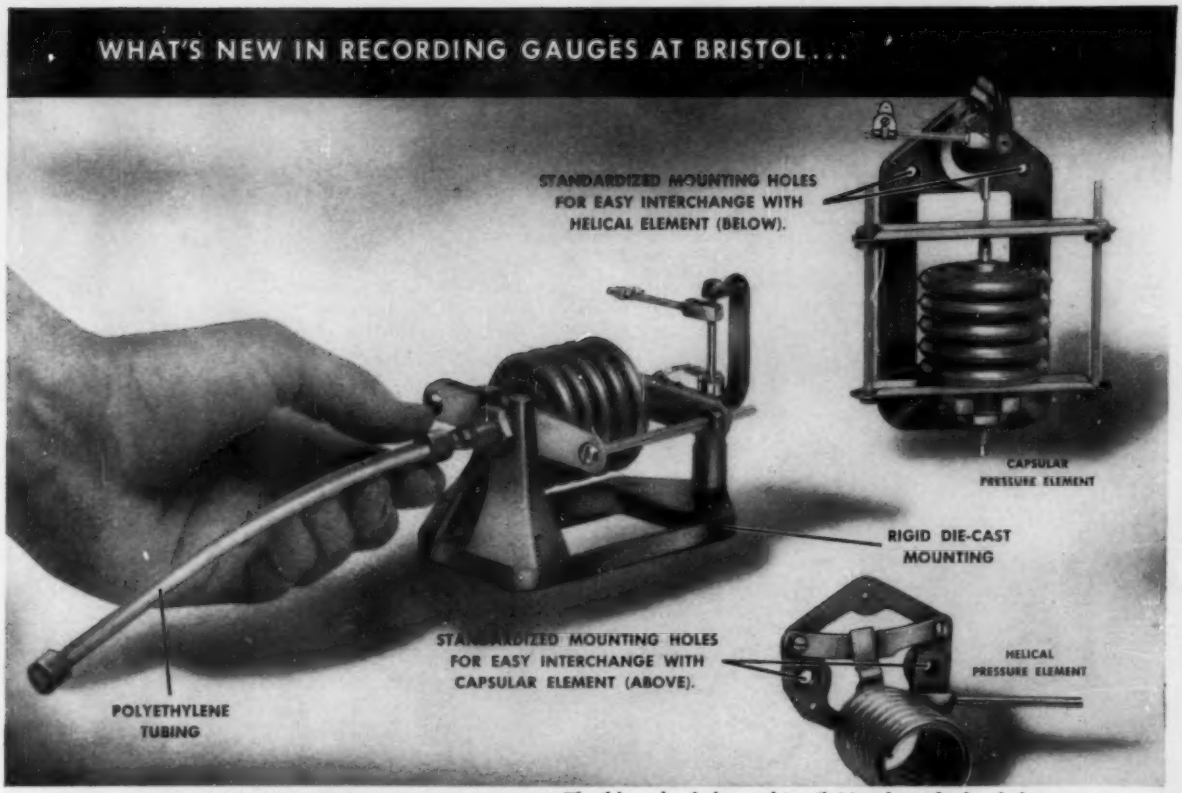
Worst natural stumbling block is the San Juan River. It can seldom be forded and there are no bridges across it between Shiprock, N. M., and Mexican Hat, Utah. This unbridged distance is more than 100 miles along the river and 65 miles as the crow flies. As a result, the San Juan cleaves the basin into two separate parts that might just as well be miles removed from each other. To move a rig only one location across the river might mean hauling it 200 miles overland. The moving cost could easily run $10,000.

There are plans for another bridge in the basin, but exact location hasn't been set and construction likely could not start in less than 1 year.

Problems making hole . . . In drilling wells to the Paradox lime pay of the Aneth area, drillers have these problems to face:

1. Shallow gyp-water flow on almost all locations, especially near creeks.
2. Bad loss of circulation in the southwest of the basin at a depth of 3,500 ft.
3. Troublesome anhydrite.
4. Deep salt-water flow in the Ismay area.

These are some of the drilling


WHAT'S NEW IN RECORDING GAUGES AT BRISTOL...
STANDARDIZED MOUNTING HOLES FOR EASY INTERCHANGE WITH HELICAL ELEMENT (BELOW).
CAPSULAR PRESSURE ELEMENT
RIGID DIE-CAST MOUNTING
STANDARDIZED MOUNTING HOLES FOR EASY INTERCHANGE WITH CAPSULAR ELEMENT (ABOVE).
HELICAL PRESSURE ELEMENT
POLYETHYLENE TUBING

RECENT BRISTOL RECORDING GAUGE DEVELOPMENTS. Flexible polyethylene tubing *(left)* and standardized element mountings simplify element interchange, provide increased mounting rigidity and vibration isolation.

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Another reason: Our continuous development program, aimed at keeping Bristol Recording Gauges far in advance of today's needs. The latest results of this program are now available in Bristol Recording Gauges:

Easy-change elements. Element mountings have been redesigned to insure interchangeability of elements. You can buy a pressure gauge with any standard helical element and change later to any standard capsular type element, or *vice versa.*

Extra mounting rigidity. Rigid cast-aluminum element mounting assures greater accuracy, stability and reliability.

Flexible polyethylene tubing used to connect measuring elements. Simplifies interchange of elements, simplifies maintenance. Isolates element from shock and vibration.

Improved element materials. Capsular measuring elements are now available in stainless steel and Ni-Span C, as well as phosphor bronze. As a result, this type of measuring element, ideal for low pressures, can now be used for a large number of corrosive fluids. Helical elements are now available in Ni-Span C, too.

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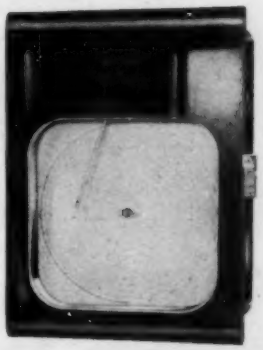

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BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Low-Solids Emulsion Mud

Reported by Dan Nolting, mud engineer,
Four States Mud Co., Farmington, N. Mex.

FOUR STATES MUD COMPANY
WELL DATA SHEET

COMPANY: Honolulu Oil Corp.	WELL: Navajo 1-14		FIELD: WC
CONTRACTOR: Great Western	LOCATION:	RGE:	TWP: SEC:
NEAREST TOWN: Aneth Trad. Post	COUNTY: San Juan		STATE: Utah
SPUDDED: 3-19-57	DATE T.D. REACHED: 4-20-57		TOT. DEPTH: 5795'

CASING PROGRAM	FORMATION TOPS: SAM-LOG	COMPLETION DATA
13 3/8" @ 219'		P/A

MUD COST	SACKS	COST	CHEMICALS USED	POUNDS	COST
Magcobar	1099	3590.44	Caustic Soda	4100	$ 502.25
Magcogel	305	610.08	Q-X Quebracho	1650	453.75
			Barium Carb	5750	599.73
			Driscose H.V.	3050	2756.13
			Alkatan 1:1	900	247.50
			Fiber Seal	480	62.08
			Lime	400	14.52
TOT. COST MUD		$4200.52	COST PER FT.		72¢
TOT. CHEM. COST		4637.96	COST PER FT.		80¢
TOT. COMB. COST		8838.48	COST PER FT.		1.52¢

MUD PROPERTIES SCHEDULE

DEPTH	4251'	4968'	5601'	5720'	5795'
WEIGHT	9.9	9.9	9.7	9.4	10.2
FUNNEL VIS.	43	38	45	45	55
FLOW LINE TEMP.					
INIT. GEL	0	0	0	0	8
WATER LOSS	13.6	7.4	9.4	6.8	6.2
PH	9.5	12.5	11.0	12.0	12.0
SALT CONTENT	165	165	412	579	660
10 MIN. GEL	5	0	5	2	5
REMARKS: Oil %	0	8	6	10	8

PREPARED BY: Dan Nolting

GEOLOGISTS don't usually approve of oil in the mud because it can be misleading as to oil-bearing formations in the well. In spite of this, the low-solids, diesel-oil emulsion mud is cheap enough that geological departments should encourage its use in Paradox basin drilling.

In its 1-14 Navajo, Honolulu Oil Corp. used a low-solids diesel-oil emulsion. With this mud, the hole reached coring point of 5,520 ft. in 18 days under 219 ft. of conductor pipe. Only 25 bits and 273¼ drilling hours were used.

The same contractor had used a gyp mud on a nearby hole. In comparison, that hole took 23 days, 38 bits, and 311 drilling hours to reach the same depth from under 1,900 ft. of surface pipe.

Drilling 1-14 Navajo . . . After setting 219 ft. of 13⅜-in. conductor pipe in its 1-14 Navajo, Honolulu drilled 12¼-in. hole to about 1,400 ft. Before setting surface pipe, the contractor ratholed ahead with an 8¾-in. bit, looking for possible water flows. Finding none and having no hole trouble, the operator decided to drill ahead without setting surface.

To about 3,800 ft., the mud was treated lightly with chemicals, and funnel viscosity from native solids was 34 to 35 seconds. To raise viscosity and help control water loss, high-viscosity Driscose was used with a minimum of bentonite; treatment with caustic-quebracho mixture kept pH between 12.0 and 12.5.

When the hole topped the lime, diesel oil was added to make a 10 per cent emulsion. This oil content was kept to total depth.

When coring began, there had been no hole trouble. Viscosity ranged from 38 to 45 seconds and weight was from 9.2 to 9.4 lb. per gal. Then, water started flowing from the upper formations and mud weight had to be raised to 10.0 to 10.2 lb. To clean up the hole after the water flow, viscosity was raised to 55 to 65 seconds. Likely, if surface pipe had been set, the water would not have flowed and weighting material would not have been needed. Since the water cut the mud, more chemicals were used than would have been otherwise. This added cost could be offset by the cost of the surface pipe.

---

practices used in overcoming these troubles.

1. Drilling surface-intermediate hole without killing the water flow.
2. Drilling much of the hole with water.
3. Using low-cost gyp mud.
4. Keeping light bit weight in anhydrite and Hermosa shale.

Don't kill water flow . . . Wells in almost all parts of the basin have found a shallow water flow. The sand that produces this gyp water lies at 550 to 1,250 ft. And, unless well location is high, this water's pressure is enough to cause flow. In locations near the creeks, flow pressures have been high enough that it took a 14-lb. mud to kill them.

It appears that the water flow is sometimes surging. Moreover, the gyp content varies with the seasons; it is more gyppy in the spring when there has been much rain and surface runoff. It is less gyppy during drier periods of the year.

When water flowed from the early wells in the area, the natural thing was to weight up the mud and kill the flow. This meant raising the weight to 12 or 14 lb. per gal. Since these high weights easily brought on loss of circulation, some holes used much more than the normal 1,500 to 1,800 sacks of weighting material. On some of these early wells, mud costs ran as high as $14,000—mostly in the surface hole.

As drillers learned more and more about the area, they stopped trying to hold back the water flow. Now, this is the usual practice. Water is used as the circulating fluid, and the excess flowing from the hole runs down the canyons. This runoff makes no pollution problem since the water is not salty and it is no more gyppy than the surface itself.

Surface-intermediate pipe . . . Since the well does flow until surface pipe is cemented, most operators take the precaution of setting one or two joints of 13⅜-in. conductor pipe. This conductor is set into the first solid formation and cemented to surface. It directs the water flow so that it cannot undermine the rig foundation.

Then, a 12¼-in. hole is drilled with water down into and through the water zone. There are other sands in this part of the hole that hold enough salt to contaminate a mud, so the surface hole is carried down to about 1,400 ft.

To cement the 9⅝-in. surface pipe, one operator uses a 1:1 mixture of pozzolanic cement containing 4 per cent gel. He also adds ¼ lb. of lost-circulation material and ¼ lb. of ground walnut shells. Usual program is to run two cement-retainer baskets on the casing and about 100 sacks of 45-second-viscosity gel ahead of the cement. The cement starts at 12.5-lb. per gal. and gradually is raised to 13.5

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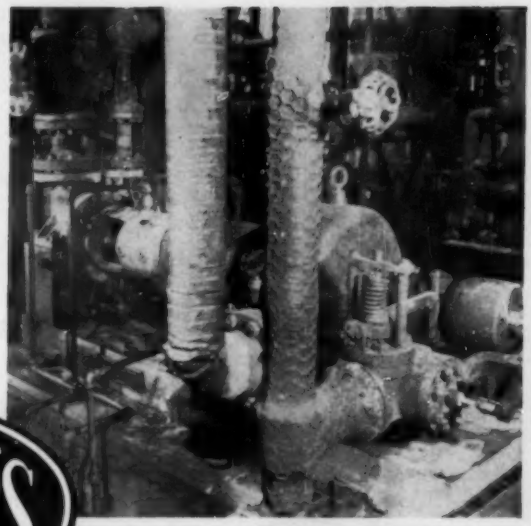

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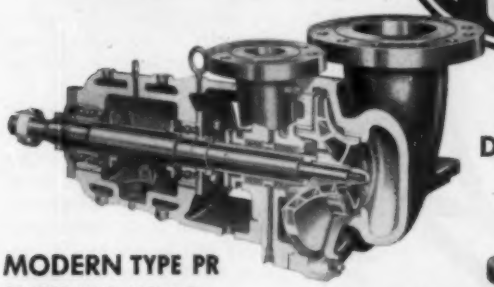

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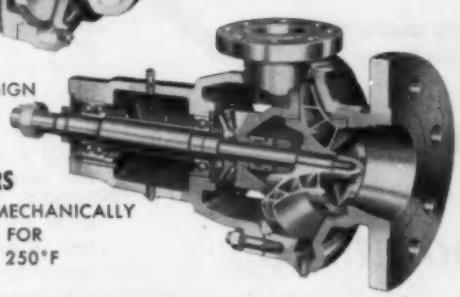

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lb. Two hundred sacks of neat cement is run on bottom, and the total of 800 sacks is usually enough to bring cement to the surface.

Water for drilling fluid . . . From under the surface, an 8¾-in. hole is drilled to total depth. And many contractors are using water to drill the interval from bottom of the surface pipe to the top of the red beds. Water, where it can be used, makes drilling faster and cuts down on the number of bits.

Most contractors run fifteen to twenty 6¾ or 7-in. drill collars and 30,000 to 40,000 lb. weight on the bit in this part of the hole. There has been no trouble with crooked hole in drilling for the Paradox pay.

Some operators prefer not to drill with water since there have been some fishing jobs in water-drilled holes. These companies feel $5,000 investment in mud is good insurance.

Other operators who have successfully drilled a number of holes with water find they can keep their total mud bill to as little as $2,000 or $3,000. These operators feel that the great saving in mud cost on the majority of wells can more than make up for an occasional fishing job.

Water for drilling is usually trucked to location from the San Juan River. However, the shallow gyp water is good enough for drilling. And there are junked holes which are completed to flow from the gyp-water zone; these furnish water for close-by locations.

Red beds drilled with mud . . . In the south part of the basin, the red beds are topped at about 2,200 ft. Farther north, in the central part of the basin, these same beds lie at 3,500 to 4,000 ft. Usual thickness of these anhydrites is 150 to 200 ft. Most drilling men in the Paradox basin don't consider these red beds as bad as those in West Texas. However, they do cause trouble if the bit isn't kept clean, so drillers have to run light weight through them.

Some operators look on a gyp mud as the cheapest, most easily controlled in this area. One such company, which doesn't ordinarily use water as a drilling fluid, uses the gyp mud from under surface pipe all the way to total depth. Down to about 5,500 ft., coring point at the top of the pay, this gyp mud will have a 40 to 45-second viscosity and a 10 to 15-cc. water loss. Weight will build up from drilled solids to about 10 lb. per gal.

Below the coring point, this operator raises viscosity to 60 seconds and keeps water loss to about 4 cc. Weight remains the same as before.

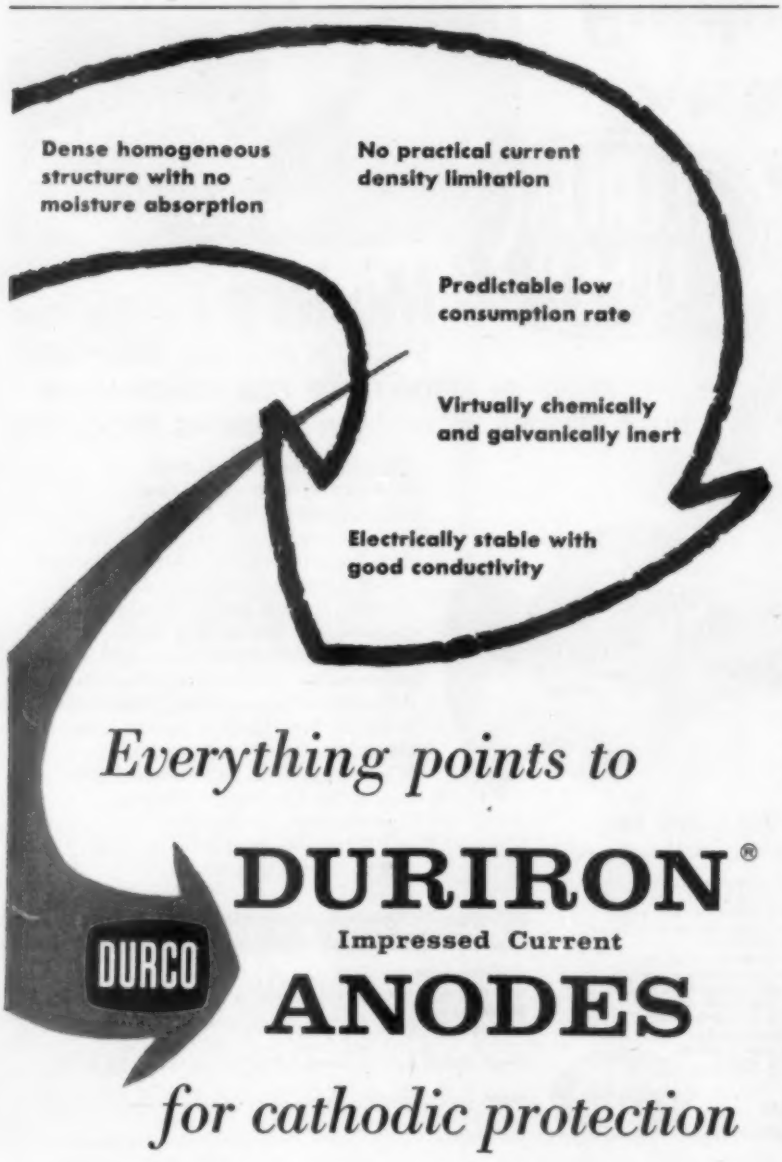
Other operators prefer to run a high-pH barium carbonate mud and treat out the anhydrite. From under surface pipe to about 4,200 ft., these companies keep a 38 to 45-second viscosity and a 10 to 20-cc. water loss. Natural weight will be 9.8 to 10.2 lb. per gal. From 4,200 ft. to total depth, water loss is cut to 10 cc. or less.

Bad loss of circulation . . . In the southwest part of the basin (see map), many wells cut a bad lost-circulation zone. The loss comes at about 3,500 ft. and the formation appears to be a fractured shale. An early dry hole in the area had a total mud bill in excess of $50,000—mostly due to the lost circulation. A recent discovery well in the area had an equally bad loss, but kept mud bill to some $20,000.

Most of the usual remedies have been tried to restore circulation. Cement, commercial lost-circulation materials, burlap bags, and the like have been used. But, none of these have given consistently good results. Most promising method to date seems to be use of an oil-emulsion mud that can be kept to 8-lb. per gal. weight.

Using oil in the mud speeds drilling, too. However, as in most sparcely drilled areas, the operators' geologists don't yet condone wide use of oil in the drilling fluid.

On the Aneth side of the river



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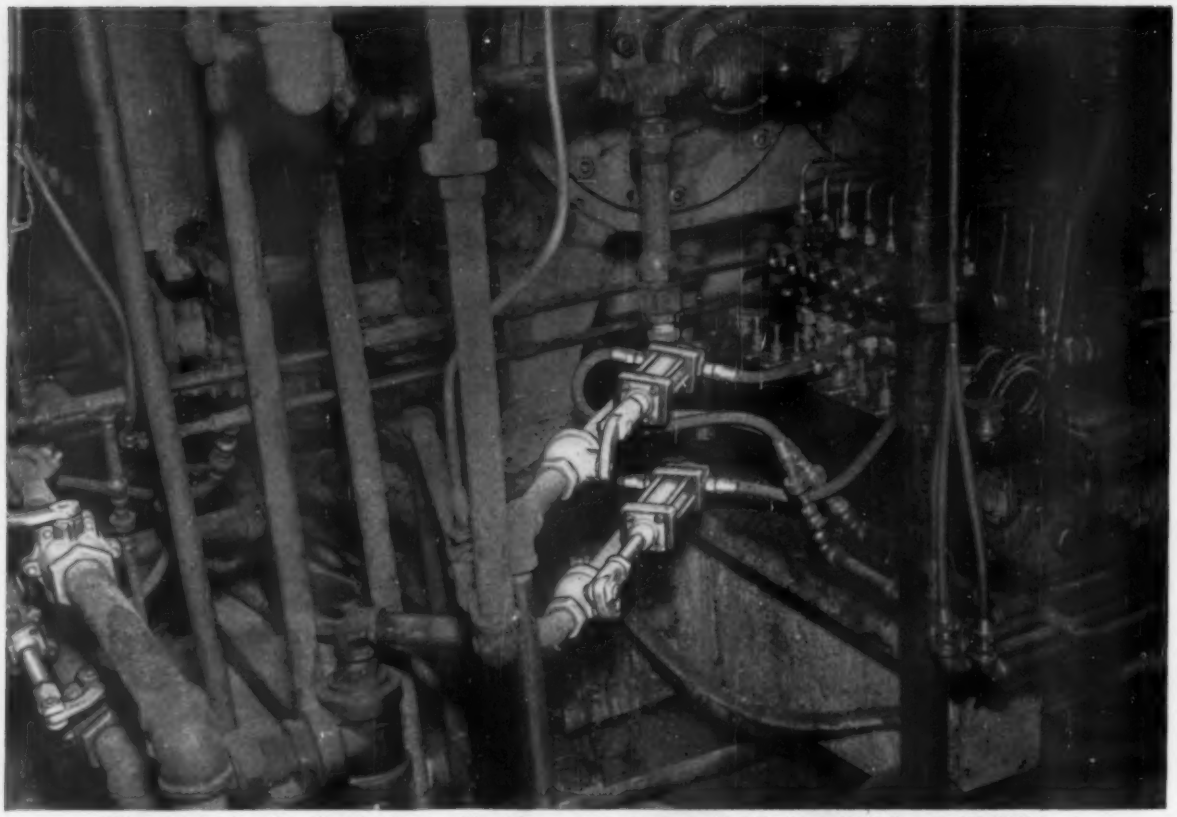

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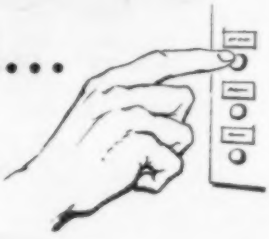

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FULL, ROUND FLOW

(see map) in the Ismay area, some wells have had trouble with a salt-water flow from a sandy gravel at about 2,400 ft. Not only does this zone flow water, it also yields pieces of gravel and red shale, so it is possible to drill through only by mudding up. A gel mud of 10.5 to 11.0 lb. per gal. is enough to permit drilling to continue. Fortunately, there hasn't been any serious loss of circulation in that same area.

Fastest time, 18 days . . . To date, fastest drilling time in the field has been 18 days from surface pipe to coring depth. This well required 25, 8¾-in. bits to the top of the Paradox at 5,520 ft. An earlier well by the same contractor took 23 days to reach the coring point.

Field wells now contract for $8.00 to $9.00 per ft. to total depth and the price ordinarily includes coring the pay. Day-work rates are from $800 to $850 with drill pipe.

Since wells are so widely spaced in the basin, most operators do core the pay zone. Already, though, some operators have quit coring any wells except stepouts and wildcats. And, as time goes on, there should be less coring and drilling time should be cut even further.

Most operators use a full-gage diamond core bit and a 50-ft. core barrel. Usual practice is to run a magnet and junk basket before coring. Also, most ream through the hole while conditioning mud in order to prevent sticking the core barrel.

Thus far, there have been only a few completions in formations other than the Paradox lime. These few completions have been in a higher lime most geologists identify as the Hermosa. There has been at least one dual completion.

Water in oil section . . . Almost all wells have pipe set through the pay and are perforated from the electric logs. Open-hole completions seem to be out of the question in many parts of the basin because of a local water zone that apparently lies in between the oil-producing strata. A few wells have already begun to produce water and are on the pump. General opinion is that this water leaks through faulty primary-cement jobs from the interbedded water zone.

It is this interbedded water that has prompted the operators to drill an 8¾-in. long hole. Since most of the oil strings are only 5½-in. diameter, the 8¾-in. hole leaves plenty of space for an effective cement seal. Moreover, most operators use centralizers on the pipe.

With 5½-in. pipe and 8¾-in. hole, about 500 sacks of neat cement is ordinarily enough to bring cement above all the possible producing zones and to seal off all water.

Bottom-hole pressure is normal for the depth, and there has been no trouble with high well pressures. Acid treatment is the only stimulation needed to put the wells on production.

Lots of development ahead . . . It now appears that the Paradox basin fields will be developed on 80-acre spacing. Most oil companies feel that this spacing is close enough to effectively deplete the reservoir and wide enough to prevent economic waste. Most of the leases are in 4-section blocks, so there are no small-acreage royalty owners to agitate for closer than 80-acre spacing.

To date, few of the 640-acre sections have more than two wells, so there are still many locations in proven areas. And there is a lot of land under lease and not yet drilled.

All oil produced in the basin in now trucked out. However, there are two long-distance pipelines planned for the area. When either or both of these is completed, drilling activity should go up immediately. **End.**

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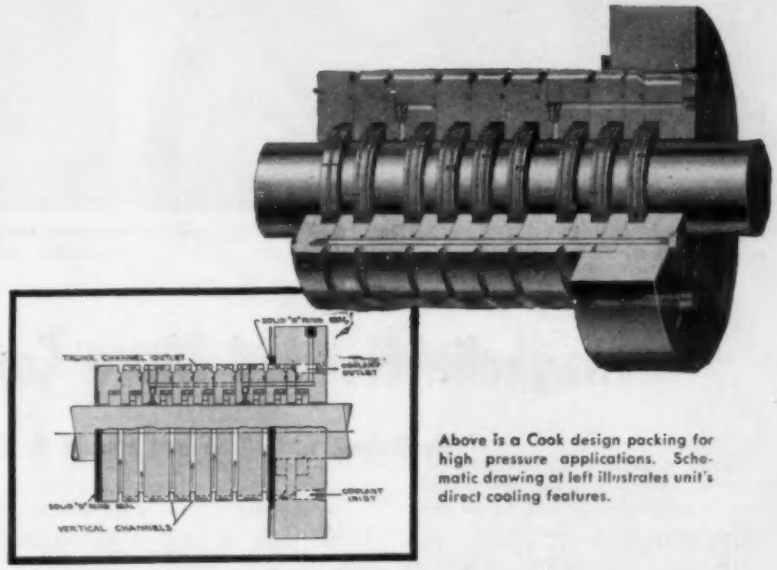

Above is a Cook design packing for high pressure applications. Schematic drawing at left illustrates unit's direct cooling features.

Cook direct-cooling designs take heat off high pressure packings

IN the design shown—which is typical of Cook pioneering in direct cooled high pressure packings—the coolant enters a trunk line at the bottom and passes through multiple vertical channels to an outlet trunk line at the top. Coolant connections are handled without arranging separate inlets or outlets through the stuffing box.

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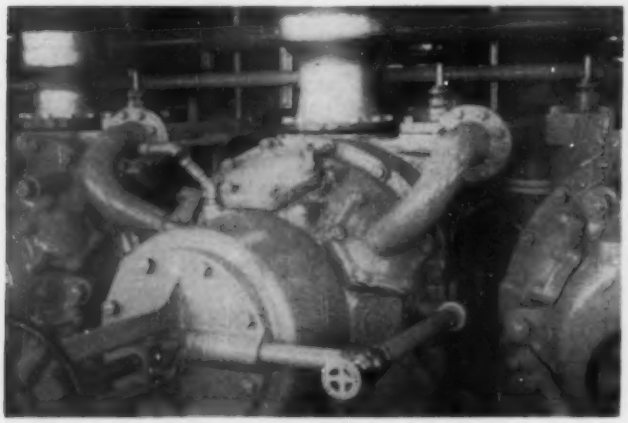
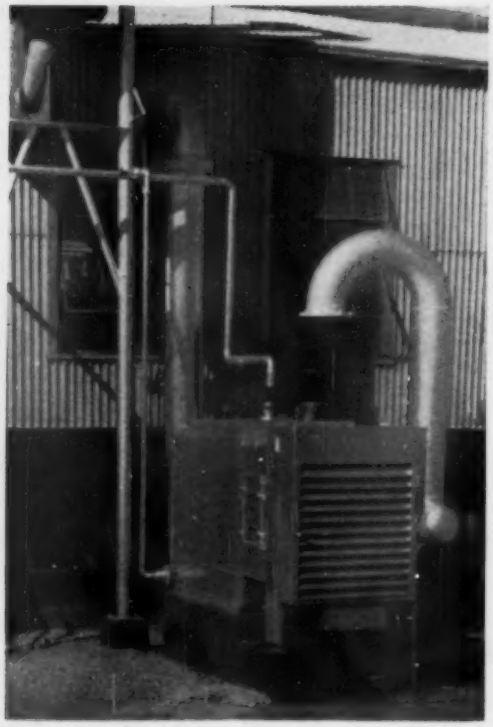


GAS-COMPRESSOR CYLINDER, shown from head end, is converted to scavenging air service. Fig. 1.



SHEET METAL UNIT, shown from front, houses humidifier and air filter. Fig. 2.

Magnolia Needed More Compressor-Station

By Robert G. Bolfing and Harold B. Emery

SUPERCHARGING existing two-cycle-engine installations should be seriously considered by all who are confronted with the need for more horsepower, Magnolia Petroleum Co. feels. This method of increasing engine output has proved successful during many thousands of operating hours.

Based on manufacturer's rating, our company has increased compressor-engine capacity as much as 25 per cent. This has been done by supercharging conventionally scavenged engines at a cost per base horsepower of only 40 per cent of original installation cost.

However, based on field tests, maximum capabilities of these engines were found to have been increased as much as 50 per cent. Using the 50 per cent gain in gas horsepower over manufacturer's original rating, the cost of supercharging was only 31 per cent of original installation cost.

Authors are with Magnolia Petroleum Co., Dallas. Paper presented at N.G.A.A. meeting in Houston, April 25, 1957.

The need for more gas-compressor horsepower at an economical cost has been an ever-increasing problem in recent years. At times the need for more gas-handling capacity by the producers has been caused by circumstances beyond their control, with no increase in ultimate revenue. As an example, some 8 years ago, our company constructed a gas-compressor station to handle casing-head gas from an oil field in Oklahoma. According to state regulations, oil wells were drilled on a 20-acre spacing pattern.

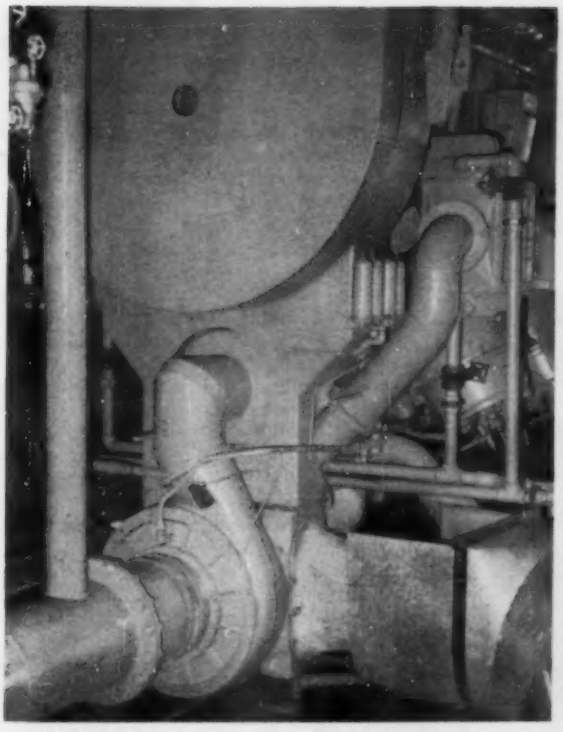
At about the same time the station was put into operation, state regulations changed to 10-acre spacings. Almost overnight gas volumes increased by approximately 50 per cent. How could our company justify the additional expenditures involved to increase engine compressor capacity when ultimate revenues remained about the same as before well spacing was changed? Yet we had no choice but to handle the increased daily volume of gas.

Increasing Engine Horsepower

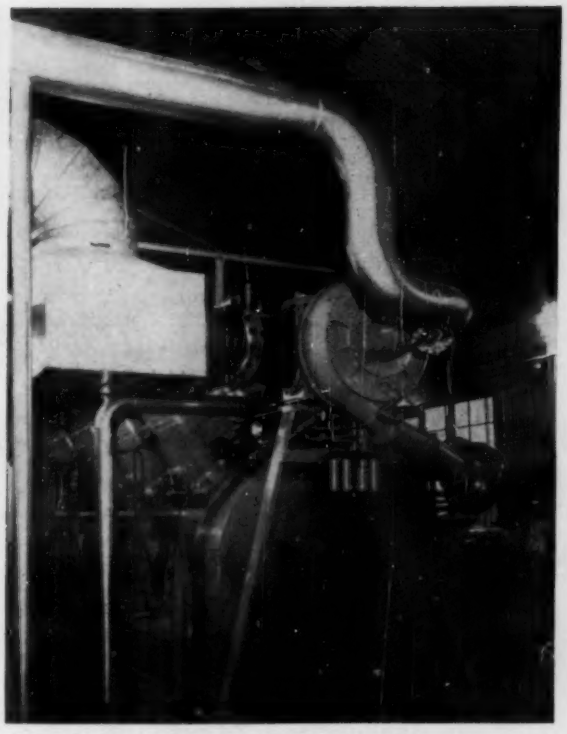
It was then that our company became interested in methods in which the load-carrying ability of engines already installed could be increased. In the compressor station under discussion, there were seven 14 by 14-in. V-angle two-cycle engine compressors with high-compression heads each rated at 1,100 b.hp.

A series of tests proved that the engines as installed would carry a 20 per cent overload before reaching the serious detonation level. Of course 20 per cent additional horsepower was still short of that required, so engineers with our company worked closely with the engine manufacturer in an effort to increase load-carrying ability of the engines still further.

First supercharging try . . . The first



FLYWHEEL-END view is of a series-turbocharged engine with turbocharger at the top foreground. Fig. 3.



END VIEW of parallel turbocharged engine is shown here Fig. 4.

Engine Capacity; Supercharging Gave It

step taken to accomplish this end resulted in failure.

This first attempt at supercharging consisted of a butterfly valve in the exhaust ell of each power cylinder. These butterfly valves were timed to close the exhaust port sooner than it would be closed by the piston on the upstroke of the two-cycle engine. The theory was that a greater charge of air for combustion would be trapped inside the cylinder.

The theory seems sound, but the limiting factor proved to be the limited capacity of the scavenging-air pumps. Closing the exhaust ports early on these conventionally scavenged engines resulted in incomplete scavenging and thus, high exhaust temperatures. Consequently the engine load at which detonation occurred was found to be about the same as without butterfly valves.

We believe there are several reasons why incomplete scavenging resulted in premature detonation, three of which are as follows:

- The internal surfaces of the cylinders were not sufficiently cooled.
- Residual burned gases were left in the cylinders and, by diluting the incoming charge of air, raised the compression temperature.
- The dilution of the fresh air charge by the burning gases results in an effectively richer fuel-air mixture.

Next attempt works . . . After it became apparent that scavenging-air volume was the limiting factor, the next step in our quest for more engine horsepower was to convert one 25-in.-diameter first-stage gas-compressor cylinder to scavenging-air service, operating in parallel with the conventional scavenging pumps. The result, as we would today have expected, was a considerable increase in engine load-carrying ability.

Table 1 gives an indication of the gains obtained with various engine arrangements during the test period. The ignition was timed to fire at 6° b.t.c. We believe fuel consumption could have been reduced somewhat by advancing the timing to 8° b.t.c. However, had this been done detonation would have occurred at a lower load level.

Supplemental scavenging air . . . Referring to Table 1, it will be noted that supplemental scavenging air from the converted 25-in. compressor cylinder without butterfly-valve arrangement increased load-carrying ability of the engine approximately 20 per cent. Butterfly-valve operation increased it another 11 per cent.

One important point has been omitted from the table which will be worth while discussing at this time. During the load tests which were run, the b.hp. load at which detonation occurred with supplemental scavenging air and butterfly valves in operation was 5.4 per cent lower than without butterfly valves. We believe that this was caused by two factors:

- Ambient air temperature was 9° F. higher during test with butterfly valves in operation, thus resulting in higher scavenging-air temperature.
- Scavenging-air temperature with butterfly valves in operation was increased still further due to the higher discharge pressure and consequently a higher ratio of compression.

The effects of scavenging-air

TABLE 1—LOAD TEST RESULTS OF 14-BY-14 V-ANGLE COMPRESSOR

ENGINE ARRANGEMENT	PROJECTED LOAD BEFORE STALLING (GAS BHP)	LOAD AT WHICH DETONATION OCCURRED (BHP) AT AMBIENT TEMPERATURE INDICATED	SCAVENGING AIR PRESSURE — INCHES OF MERCURY	AVG. EXHAUST TEMPERATURE AT DETONATING LOAD °F	** SPECIFIC FUEL CONSUMPTION FT.³ / BHP–HR.
1 NORMAL SCAVENGING AIR, EXHAUST BUTTERFLY VALVES IN OPERATION AND 1350 POWER CYLINDER HEADS.	1316	1316 (50°F)	4.8	758	9.71
2 NORMAL SCAVENGING AIR, EXHAUST BUTTERFLY VALVES BLOCKED OPEN AND 1350 POWER CYLINDER HEADS.	1305	1305 (52°F)	4.1	702	
3 SUPPLEMENTARY SCAVENGING AIR, EXHAUST BUTTERFLY VALVES BLOCKED OPEN AND 1350 POWER CYLINDER HEADS.	1576	1576 (71°F)	7.4	600	9.87
4 SUPPLEMENTARY SCAVENGING AIR, EXHAUST BUTTERFLY VALVES BLOCKED OPEN AND 1100 POWER CYLINDER HEADS.	1560	1511 (64°F)	7.2	622	9.46
5 SUPPLEMENTARY SCAVENGING AIR, EXHAUST BUTTERFLY VALVES IN OPERATION AND 1350 POWER HEADS.	1720*	1494 (73°F)	9.5	662	8.67

*This engine arrangement did not show indications of stalling at high loads shown.
**Fuel net heating value 998 B.t.u. per cu. ft.

Note: The b.hp. loads shown for engine arrangements Nos. 1 and 2 are actual gas loads, while the b.hp. loads shown for engine arrangements Nos. 3, 4, and 5 are projected loads. This artificial loading was done by shutting off the fuel gas from one of the 10 power cylinders and having the engines carry maximum load before stalling on 9 cylinders.

temperature on two-cycle-engine combustion characteristics are discussed later. It is our opinion that had the units with supplemental air been equipped with scavenging-air cooling equipment, the engine with exhaust butterfly valves in operation would have carried at least 10 per cent more b.hp. load with good combustion characteristics than an engine without the valves. However, due to mechanical difficulties with the exhaust valves, coupled with a decision not to install scavenging-air cooling equipment, the butterfly valves were removed from all our engines

Converted Compressor Cylinders

The seven engines under discussion, as they are now equipped with 25-in. converted compressor cylinders supplying supplemental scavenging air, have been operated continuously at 129 per cent of the engine manufacturer's original standard b.hp. rating.

Cylinder conversion . . . Mechanically, the 25-in. gas-compressor cylinder was converted to scavenging-air service by intercharging the cylinder-suction and discharge valves. With this change, the air entered the cylinder from the bottom and was discharged out the top. Fig. 1 is a view of the converted cylinder, looking from the head end.

An 8-in. suction line was welded onto the original scavenging-air line leading to the conventional scavenging pump which took suction from the oil-bath air filter. At the 25-in. converted cylinder the 8-in. suction line was welded to the cylinder riser from the discharge volume bottle, and a blind plate was inserted in the volume-bottle inlet flange. The above was done in this manner since this one bottle was installed to serve three, first-stage gas-compressor cylinders, and two cylinders were to remain in gas-compression service.

Two 4-in. lines were welded at one end to the discharge valve covers which had been modified and at the other end were welded to the engine bedplate inspection doors which cover the scavenging-air passageway. The conventional scavenging-air pumps were not modified in any way whatever.

Positive-Displacement Blowers

At a different location from the one under discussion above, our company had another 14 by 14-in. V-angle two-cycle engine in gas-compression service which was equipped with exhaust butterfly valves and rated at 1,350 b.hp. gas load. Similarly, these exhaust valves were removed from this engine. However, operating conditions were such that all compressor cylinders were needed for gas-compression service.

Therefore, in order to maintain the engine b.hp. continuous rating at approximately 23 per cent above standard rating, a positive-displacement blower was installed in parallel with the existing conventional scavenging-air pumps. The capacity of the positive-displacement blower is not as great as the 25-in. converted compressor cylinders on the other units. But sufficient air is supplied to the scavenging air system so that the engine easily carries rated b.hp. load and has an overload capacity of approximately 10 per cent.

The positive-displacement blower is belt driven from a sheave attached to the flywheel end of the crankshaft. One disadvantage of this type blower is that the belt drive requires frequent attention. However, this is not considered to be a major maintenance problem.

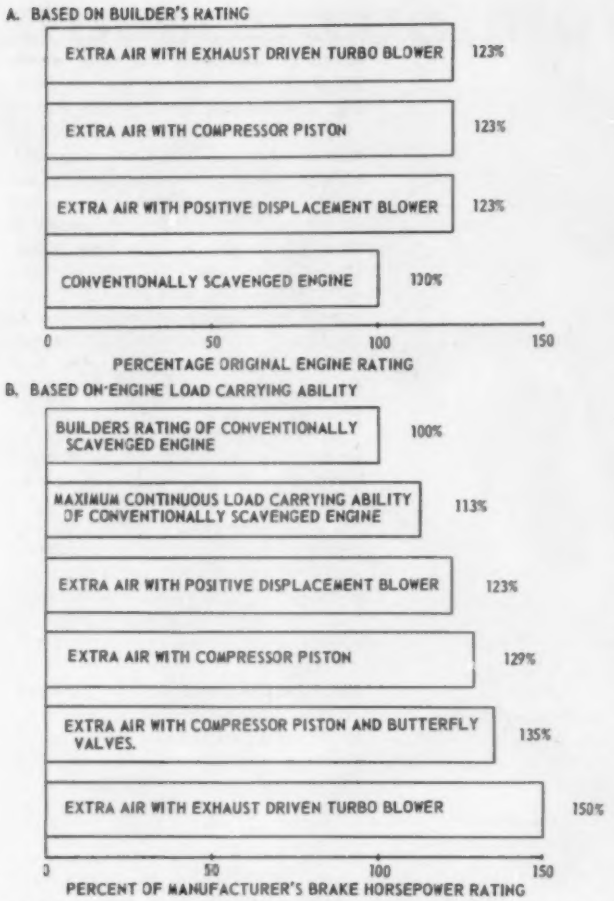
In compressor stations where a surplus of electrical power is available the blower could be driven by an electric motor. Thus part of the parasitic scavenging-air load is shifted from the compressor unit to the electric power system. Brake-horsepower loads required to drive the various types of scavenging-air equipment will be discussed later.

Later Supercharging Experience

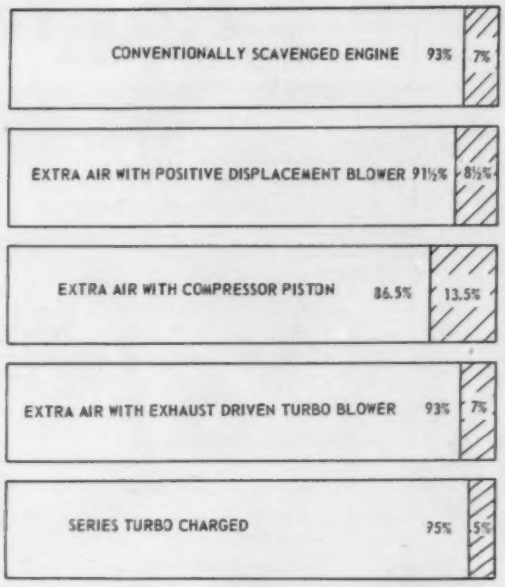
Our next experience with a supercharged engine was some 3 years later at a compressor station in West Texas at which we installed ten 10-cylinder 14 by 14-in. V-angle compressor units. Nine of these were standard engines with high-compression cylinder heads, rated at 1,100 b.hp. (sea-level rating). The tenth unit was a new type supercharged unit rated at 1,350 b.hp. (sea-level rating).

Fluid coupling problem . . . The conventional scavenging-air pumps were omitted from this new type unit; the engine was totally scavenged by a centrifugal blower which was mounted on the flywheel end of the engine. The blower is gear driven from the crankshaft, there being a hydraulic coupling between the engine drive and the blower. A special scavenging-air filter with low pressure-drop characteristics was installed in conjunction with the centrifugal blower.

Operation of the fluid coupling proved to be the only major difficulty experienced with this new type engine scavenging-air system. Oil for the hydraulic coupling was supplied by the engine lube-oil pressure system. And a "one-shot oil piston" was built into the unit to force a small quantity of oil into the coupling



COMPARATIVE GAINS in maximum continuous load-carrying abilities of parallel supercharged 14-by-14 V-angle compressor engines. Fig. 5.



COMPARISON of scavenging air horsepower loads of various engine scavenging combinations—based on manufacturer's engine ratings. Note: Crosshatched areas represent scavenging air compression parasitic load on the engine. Fig. 6.

whenever it was subjected to starting air pressure during engine-starting operation.

We learned that the piston didn't force enough oil into the coupling to properly drive the blower during engine startup. After we had experienced engine scavenging-air system explosions, the manufacturer installed an air-motor-driven pump to supply ample oil to the fluid coupling. The air motor operated only during the period that the engine was being "turned over" with starting air.

Explosion precautions . . . As all two-cycle engine operators know, it is most important that the entire scavenging-air and exhaust system be thoroughly purged with air before turning the ignition switch to firing position during engine startup. Otherwise, any gas which might have leaked into the power cylinders and out into the scavenging-air and/or exhaust system while the engine was down will ignite the instant the ignition fires.

The severity of the explosion of course depends upon the amount of gas and the gas-air ratio. The startup hazard is inherent in all two-cycle gas-engine design. Therefore we believe that purging with air during startup operation is a most important factor to take into account before deciding how to supercharge any large two-cycle engine.

Engine Performance

We might now briefly discuss the performance characteristics of this engine which was totally scavenged by a centrifugal blower. Load tests indicated that the manufacturer's load rating of 1,350 b.hp. was too conservative. The engine apparently was capable of handling a gas load of 1,500 b.hp. In view of this, our company and the manufacturer agreed to operate the engine continuously at this higher load.

Frequent inspections indicated no abnormal engine wear. However, breakage of the top power piston rings caused some difficulty. We feel that ring breakage was due in part to bad engine-combustion characteristics during periods of high ambient-air temperature. Also, piston-ring design apparently contributed to the difficulty.

Engine conversion . . . After about 2 years of otherwise satisfactory operation, our company and the manufacturer agreed to install additional scavenging-air equipment and rerate this particular engine at 1,800 b.hp. This is equivalent to 1,910 b.hp. at sea level, since the engine was in operation at an altitude of 2,894 ft. Following are some of the items installed at the time of this conversion:

. . . **Exhaust turbine-driven** blower.

. . . **Dry exhaust manifold** and one air manifold for each bank of power cylinders.

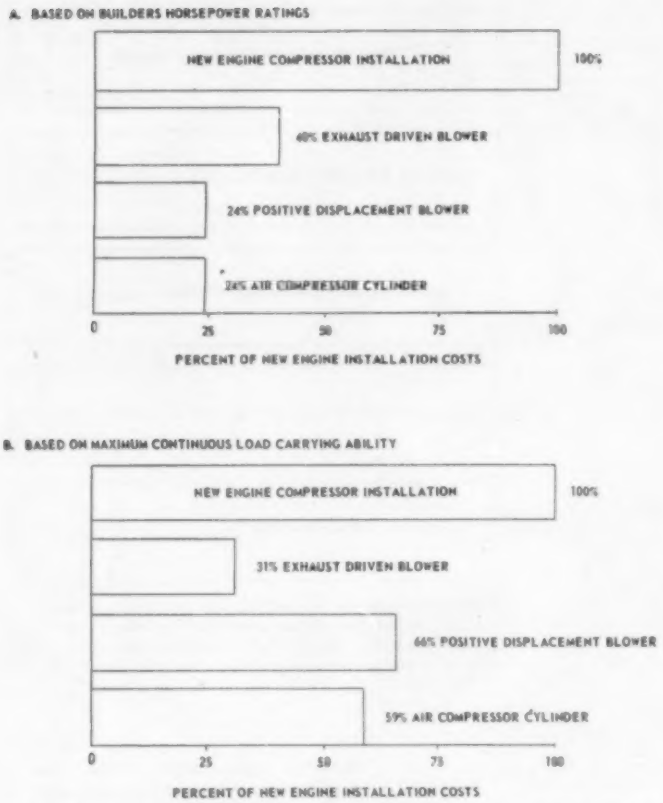
. . . **Scavenging air** aftercoolers.

. . . **An oil wetter** air filter incorporated in with a humidifier.

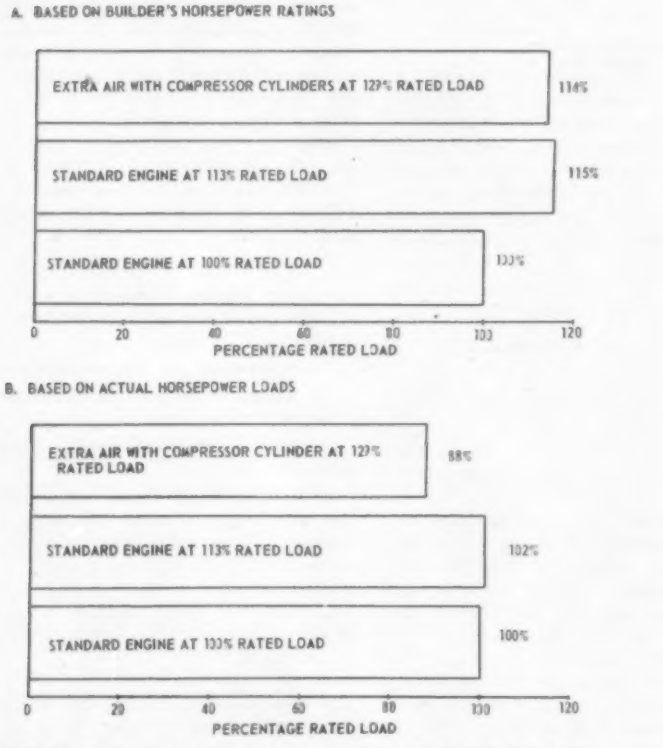
. . . **Larger gas-compressor** cylinders.

In addition to the above items, baffles were removed from the exhaust silencer so that back pressure at the turbine exhaust would be reduced to a minimum. It was found during later tests that this back pressure is approximately 0.5-in. Hg, which is well within limits.

Air treatment . . . With the above equipment installed, scavenging air first passes through an oil-wetted roller-type filter element specially



COSTS of parallel supercharging conventionally scavenged two-cycle compressor engines vs. new-engine installation costs. Fig. 7.



ENGINE maintenance costs for various engine loads of 14-by-14 V-angle compressors. Fig. 8.

designed for low air-pressure drop. It then passes through a humidifier, which is housed in the same sheet-metal unit that houses the air filter. Fig. 2 is a front view of this unit.

The turbine-driven centrifugal blower takes suction from this combination air filter-humidifier and boosts it directly into the suction of the gear-driven blower, which in turn discharges it into the water-cooled aftercoolers. There are two such aftercoolers, and each discharges into a scavenging-air manifold. An abundance of relatively cool humidified air is then available for both the scavenging and combustion process.

This engine which is now referred to by the manufacturer as being a series-turbocharged unit has been tested under loads as high as 2,070 gas b.hp. During a period of high compressor-station inlet-gas volumes it was observed that the engine was carrying a 2,200-b.hp. gas-compression load, with no apparent deterioration in combustion characteristics.

Maintenance problems . . . However, at these higher continuous loads mechanical maintenance difficulties became a problem. Higher attendant scavenging-air pressures caused gasket failures between power cylinders and the bedplate. Breakage of the top power piston rings continued to a lesser degree after this latest conversion, but this was now a major problem since pieces of broken rings traveled through the cylinder exhaust ports and into the exhaust gas turbine where damage was done. It was the opinion of some that power-cylinder life was a borderline case at the higher firing pressures which attended higher brake-horsepower loads. However, it developed that the chief weakness was in the main engine frame, since it broke in several places. Attempts to repair the breaks proved unsuccessful.

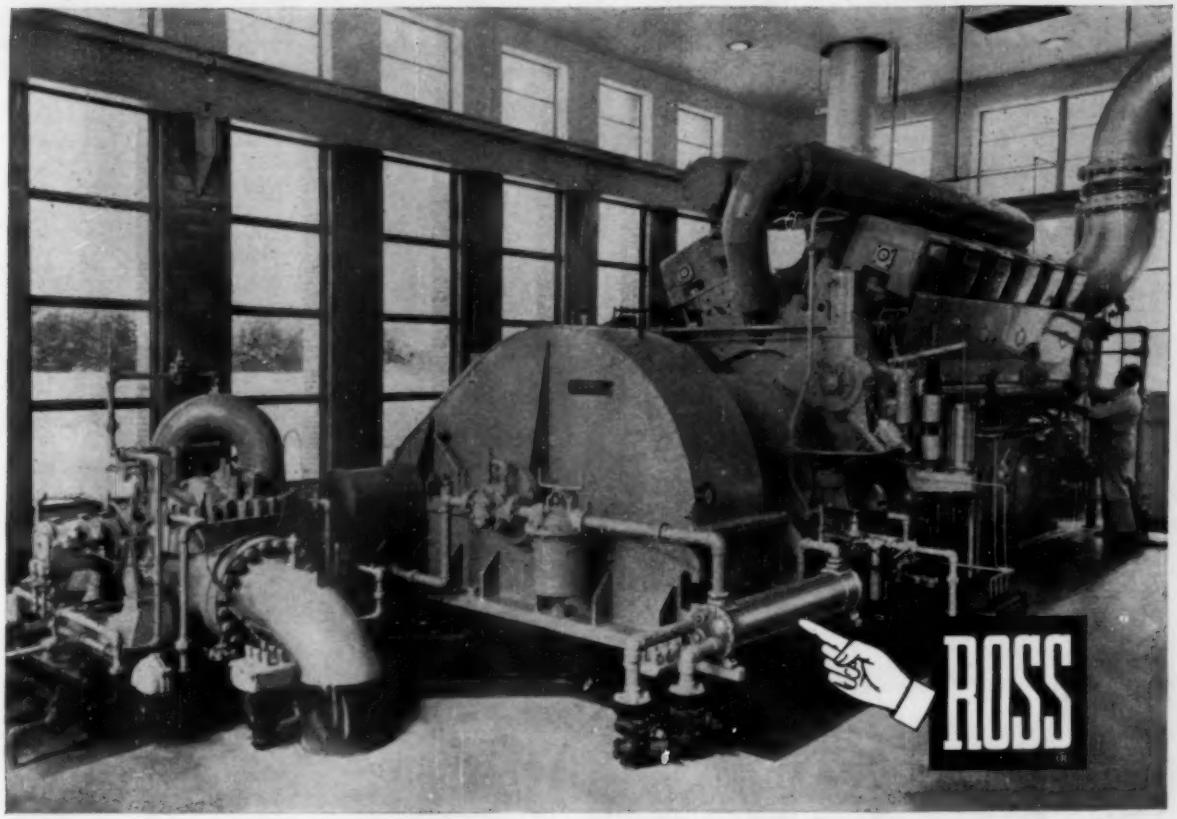
Modifications

At this stage of supercharging, it became apparent that it was no longer a problem of how to get more combustion air and fuel gas into the cylinder, conditioned in such a way to result in smooth, detonation free combustion. Rather it was now a problem of mechanical stress overloading of the engine parts. Therefore, after a test period of approximately 1 year, operating at gas loads of 1,800 b.hp. and higher, the following modifications were made:

The engine main frame was replaced with one of stronger design.

The original power cylinders were replaced with chrome-plated cylinders.

LUBE OIL COOLING BY ROSS



4,000,000 gallons a day race through 295-mile pipeline

At work in a midwestern pumping station, this Farrel Speed Increaser serves a 295-mile 16-inch petroleum pipeline transmitting 4,000,000 gallons a day. In unbroken service, it steps up the 500 rpm of a 2500 hp engine to the pump speed of 5100 rpm.

"**CONTINUOUS,** trouble-free operation is the first requirement of speed increasers for pipeline service," reports Farrel-Birmingham Co. "Of the hundreds and hundreds of these units installed since 1932, not one has ever had to be replaced."

SUCH PERFORMANCE records can only result from careful engineering, fabrication . . . *and* selection of components. *Take lubricating oil coolers for example.* An important part of the self-contained, circulating oil system on the speed increaser shown here is a Ross Type BCF Exchanger. Its function: To maintain oil temperature at the correct level so that bearings and gears are effectively lubricated.

THERE'S NO STRONGER evidence that Ross Exchangers are performing this function *reliably,* than the fact that Farrel-Birmingham has used them over a long period of time. Second to none in ruggedness and thermal efficiency, they are regularly installed by numerous makers and users of all types of machinery where heat control is a factor.

COMPACT ROSS EXCHANGERS are pre-engineered and fully standardized in a wide range of sizes to meet most heat transfer requirements. Bulletin 1.1K5 has the details. Write for your copy. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN-Standard

Aluminum main bearings and Trimetal connecting-rod bearings were installed, replacing standard babbitted bearings.

A new turbocharger was installed, since the original one was damaged by the pieces of broken piston rings which passed through it.

The top two piston rings were replaced with rings of a different design.

Major problems eased . . . Since modification, the engine under discussion has now been operated under an 1,800-b.hp. gas load for 5 months During this time two major inspections have been made. The only difficulties are excessive lube-oil usage and oil-control piston-ring wear. It is our opinion that a relatively rough finish on the chrome-plated cylinder walls is the cause for these difficulties.

The time required for breaking in chrome cylinders is relatively long even under ideal conditions. We anticipate that it will take 10 to 12 months' operating time to properly break in these cylinders. However, after the break-in period we are hopeful that their service life will extend over a period of 15 to 25 operating years.

As has been the case since this unit was initially series turbocharged, we are highly pleased with its load-carrying ability and combustion characteristics. And except for the slow break-in rate of the chrome cylinders, we believe all major mechanical maintenance difficulties have been alleviated.

Fig. 3 is a view of the flywheel end of the series-turbocharged engine. The turbocharger is visible at top foreground. Also visible are the discharge line from this blower that leads to the gear-driven centrifugal blower which is hidden behind a guard, and the discharge line from this blower to one of the air aftercoolers.

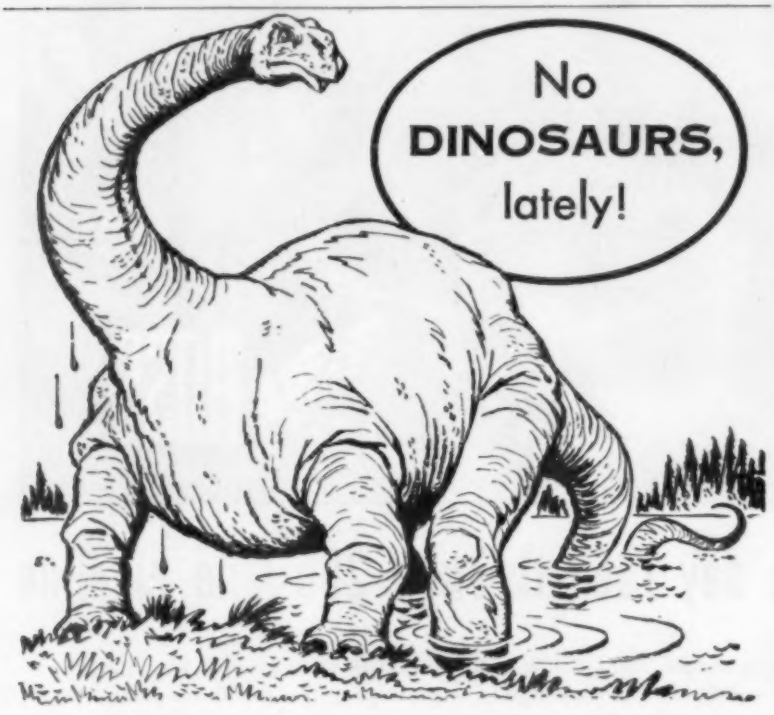
We have recently parallel turbocharged two eight-cylinder 14 by 14-in. V-angle conventionally scavenged compressor units, which increased manufacturer's brake horsepower rating by 25 per cent. With this arrangement, a turboblower takes suction from an oil-bath air filter which was installed in conjunction with installation of the turbocharger. The blower discharges into a manifold which in turn distributes the air to the scavenging air chamber in the engine frame, where it commingles with the air from the conventional scavenging pumps.

Fig. 4 shows an end view of one of the units.

Combustion-air cooling is not employed with this arrangement. We are of the opinion that cooling will not be required so long as the manufacturer's present rating is not exceeded by any great amount. With an ambient air temperature of 55° F., one of these parallel-turbocharged engines was tested at 179 per cent of manufacturer's original rated gas horsepower. This is equivalent to 143 per cent of manufacturer's rating after supercharging.

At this high load during the test period, combustion characteristics were good. Orsat analysis run on the engine exhaust gas indicated that 155 to 180 per cent excess air was present.

One fact that merits consideration is that the main engine frame of standard 14 by 14-in. V-angle compressor units is now rated by the manufacturer at 150 per cent of original standard rating of engines with high-compression cylinder heads. This is maximum-load rating beyond which the stresses set up in the frame are considered too great for continuous operation. In view of this, we intend to limit the maximum load on all of our compressor units to manufacturer's maximum frame rating.



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It too is machined from solid bar stock—in this case, 416 stainless steel. Its precision-ground and-machined stem is hardened 416 stainless. Packing is the special "Marpak" ring . . . one-piece, non-binding, long-lasting. So finely built is this needle throttling and cut-off valve that it can be easily throttled down to exceptionally fine regulation even on extreme pressure.

Read the list of features opposite. Then write for new bulletin No. NV-2 containing complete details.

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Maximum Working Pressure 10,000 P.S.I.

Water, oil, gas or corrosive fluids not injurious to 416 stainless steel.

The new all stainless valves (Series 1924) includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾", 1"; also globe and angle valves with male inlet and female outlet in sizes ¼" and ½".

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IN 1884...73 YEARS AGO...

They Scoffed at Wm. Graver's Determination to Build Storage Tanks with Light Plate

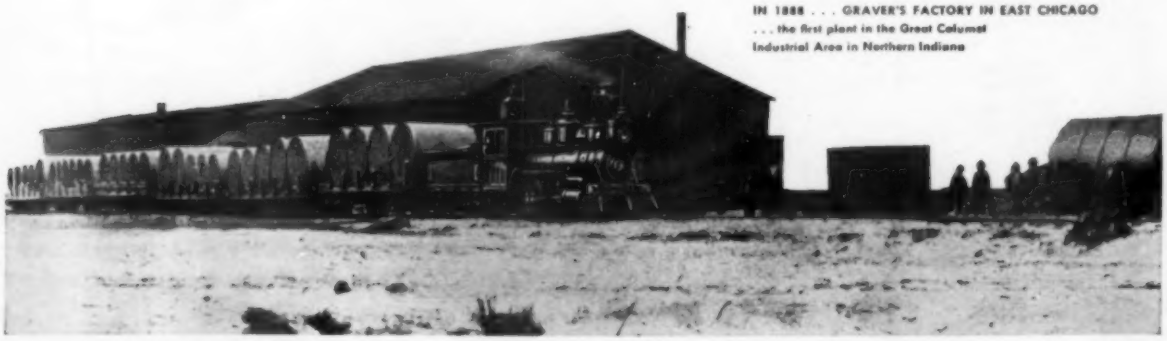
Quoted from an article "Graver Tanks Are Monuments to Confidence, Energy and Skill," The Southwestern Oil Journal, December 5, 1919:

"• • • It had been the theory of Chicago tank builders that tanks should be constructed like boilers—made of heavy material and capable of standing a great pressure. Mr. Graver could erect his tanks much cheaper than those being put up by the Chicago concerns, but he was unable to get his just share of the business. He took contracts for other kind of work and his perseverance was finally rewarded by a contract to build four linseed tanks of considerable size for a Chicago concern. Failure was predicted by his competitors and Joseph T. Ryerson, from whom he was purchasing the material, also became skeptical of the outcome.

Having called Mr. Graver into conference and being assured that he had successfully constructed the lighter tanks for the Standard Oil Company, Mr. Ryerson gave the oil company his word that the tanks would fill all requirements and Mr. Graver was allowed to go on with the contract. William Graver, his son, J. P. Graver, now president of the company and Mike Sheets, the construction foreman, got the material out for the tank at their plant in Clark street.

The tank trade was especially interested in the construction of the tanks and they gathered daily to watch the erection. Gloomy predictions were voiced from the laying of the bottoms to the completion of the tanks. However, William Graver had his day when the first tank was tested out. A large crowd was on hand to see the tank filled up, and as the gauge on the tank soared and it still held, many of his competitors turned on their heels, wiser apparently in tank construction.

It was upon the completion of this tank that William Graver began to reap the fruit of his labor. Orders came pouring in and from that day to this the Gravers have been favored with a large share of the tank business."



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Results of the above supercharged engine load test point up the fact that horsepower output is not the limiting factor in rating present-day large internal-combustion engines.

Fig. 5 summarizes the gains we have experienced with these engines which were originally equipped with conventional scavenging pumps only. The gains shown in Fig. 5A are based on manufacturer's brake-horsepower output rating. The gains listed in Fig. 5B are based on maximum continuous gas loads at which our engines have successfully operated during periods when ambient-air temperatures were at, or near, 100° F.

The one exception to this is the engines which are equipped with a turbocharger. While these turbocharged engines have been tested under gas loads as high as 179 per cent of rating before supercharging, they have not been operated continuously at loads higher than manufacturer's ternal-combustion engines.

Horsepower Gains

Fig. 6 presents the parasitic scavenging-air compression brake-horsepower load on the engine for the various ways in which our engines are scavenged. Up to the present time our company has had no engines scavenged totally by a turbocharger. However, these turbocharged units utilize only waste heat energy to do the scavenging work. In view of this they put no parasitic scavenging-air compression load on the engine.

Except for units supercharged by converting gas-compressor cylinders to scavenging-air service, which were equipped with medium-compression cylinder heads, engine compression ratios were not lowered on our supercharged units. This, coupled with advanced ignition timing, has made possible lower fuel rates.

We have recently conducted a test to determine the effect of ambient air temperature on combustion characteristics of two-cycle engines operating without scavenging-air cooling equipment. It was found that a reduction of ambient air temperature from 108° to 92° F. increased the gas horsepower load at which detonation occurred by 10 per cent.

Relative humidity remained almost unchanged during the test period. On engines where combustion characteristics are not smooth and where detonation is a border-line case, we feel that combustion-air cooling would be valuable.

Up to now, we have not developed what effect humidity has on load-carrying ability of the engines under discussion. Nor have we been able to get information from manufacturer.

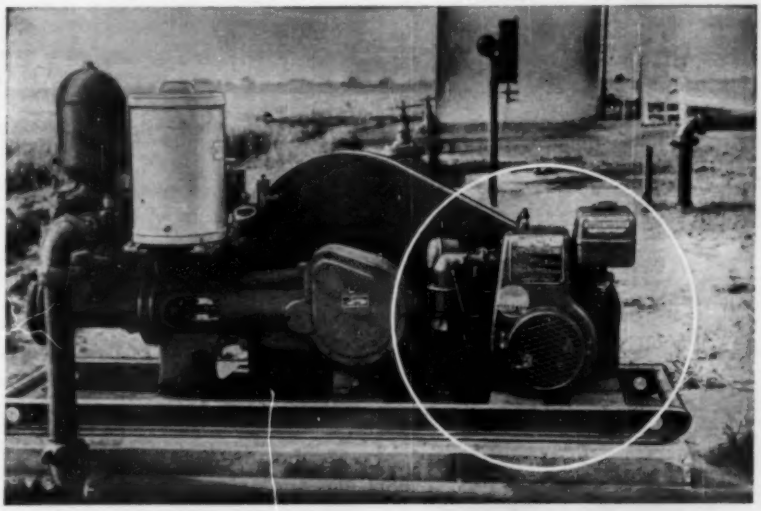
Scavenging-air temperature . . . Temperature at which the scavenging air should be maintained depends upon a number of variable factors. First among these, we feel, is scavenging efficiency of the engine.

Our experience has been that at a given ambient temperature the load at which detonation occurs on any of our two-cycle engines becomes lower as the cylinder intake and exhaust ports become plugged with carbon. This is one example which indicates how scavenging efficiency can be reduced.

We feel that scavenging efficiency of some engine designs is inherently low; therefore, these engines would require lower scavenging-air temperatures than if they were properly scavenged. Other variables which determine maximum permissible scavenging-air temperature level are as follows:

1. Engine compression ratio.
2. Engine ignition timing.
3. Composition of the fuel gas.
4. Quantity of scavenging air.
5. Magnitude of engine brake-horsepower load.

Cost of supercharging existing con-



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Recycling Unit Gives
B. S. & W. the Full Treatment!

Recovering marketable oil from "Cut" oil is the productive assignment of this Model BKN Wisconsin 4-cycle Single Cylinder Air-Cooled Engine, driving a Goulds Reciprocating Pump.

As every oil field operator knows, when B. S. & W. content exceeds about 1%, this oil is due for rejection by the pipeline purchasing company and consequently can be salvaged only by proper treatment. The Wisconsin-powered recycling unit shown here pumps the bad oil from the rejection tank into the heater treater where the water is allowed to coalesce, then back into the storage tank. As the oil passes through the recycling unit, a small quantity of de-emulsifying chemical is injected into the oil and water emulsion by a McCord chemical pump.

Where B. S. & W. is a problem, a unit of this type can pay its cost many times over through salvaged, marketable oil. And the small but extremely rugged Wisconsin Heavy-Duty Air-Cooled Engine stays on the job in all weather, with an absolute minimum of maintenance attention and servicing.

No matter what your engine power requirements may be within a 3 to 56 hp. range, there is a Wisconsin Heavy-Duty Air-Cooled Engine of exactly the right size to fit your oil field utility units. **You** can't do better than to specify "Wisconsin Power."

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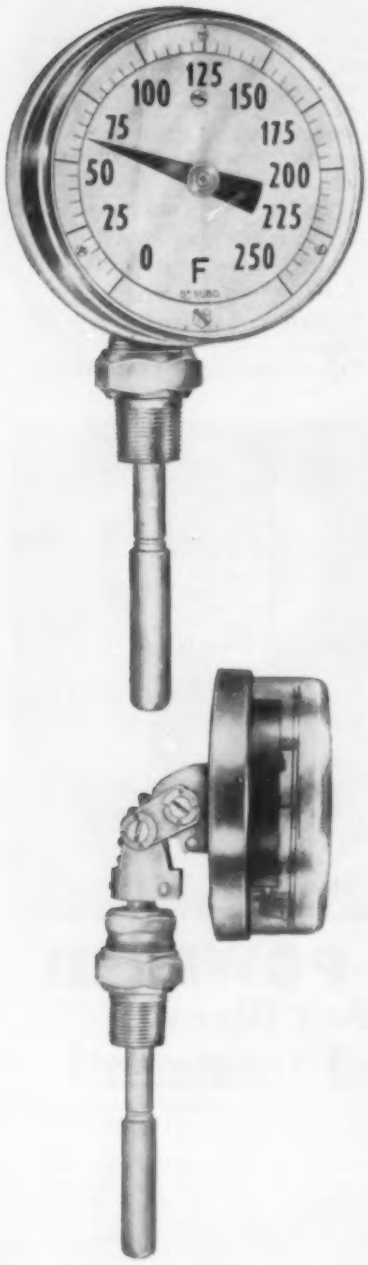

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Where resistance to corrosion is important, where appearance and cleanliness are essential, the 'American' Mercury-Actuated "Every Angle" Dial Thermometer is ideal. It is rugged – has every quality required for the toughest services, indoors and outdoors. From the standpoint of economy, the "Every Angle" feature alone can save money in new piping specifications and when changing existing piping. It reduces the need to re-specify and stock a variety of fixed stem thermometers.

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ventionally scavenged two-cycle engines is considerably less than installation cost of additional engines. Fig. 7 indicates the savings to be expected.

Referring to Fig. 7-A, which is based on the manufacturer's b.hp. load rating, parallel supercharging with an exhaust turbine-driven blower costs our company 40 per cent of what it cost to install the original engines. Supercharging with either a positive-displacement blower or a compressor cylinder costs only 24 per cent of original compressor installation cost.

However, referring to Fig. 7B which is based on maximum continuous b.hp. loads, cost of the turbocharger installation is reduced to about one-half the cost of supercharging by the other two methods. We want to emphasize at this point that we are not necessarily recommending that engines be loaded beyond the manufacturer's b.hp. rating. Overloading could result in prohibitive maintenance costs. However, our experience has been that when figured on the basis of dollars per b.hp. engine operating load, maintenance costs are sometimes lower on engines that are being operated above manufacturer's rated b.hp.

Maintenance costs . . . With reference to Fig. 8-A, we are presenting relative total maintenance costs developed from a cost survey made on three separate compressor stations, each operating under different load conditions. Except for the method of scavenging-air compression, engines at each station are identical.

Conventionally scavenged engines operated at full manufacturer's rated load were the basis for the maintenance cost comparison. It will be noted that for engines which were operated at 13 per cent above rated load, total maintenance cost was 15 per cent higher than for engines operated at or near rated load. With engines operated at 29 per cent overload, maintenance cost was 14 per cent higher.

Fig. 8B presents relative maintenance-cost data based on actual engine output. It can be seen that on this basis (dollars per b.hp. output), maintenance cost was only 2 per cent higher on conventionally scavenged engines operated at 13 per cent b.hp. overload. On engines with supplemental scavenging air, maintenance cost was 12 per cent lower. We believe that our decision to increase compressor-engine b.hp. output above original manufacturer's rating where more gas-handling capacity is needed has been justified.

CORROSION

TYPE	HOW TO IDENTIFY
GALVANIC	Localized deep grooves or pits, often at contact between dissimilar metals.
UNIFORM	Uniform attack—may be on only one part.
INTERGRANULAR	Attack at grain boundaries.
PITTING	Rapid, deep pitting at several small areas. May be uniform or highly localized.

Why you can conquer all four kinds of corrosion with Goulds chemical pumps

When you buy Goulds Fig. 3715 chemical pumps you can build *specific* protection against all four types of corrosion.

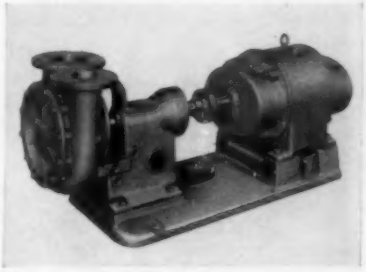
Match the pump metal to your liquids. You can have the *entire* fluid end of the pump made of 316 stainless, Gould-A-Loy 20, nickel aluminum bronze, iron, iron with stainless trim or nickel aluminum bronze trim. These metals from stock. Any machinable alloy on application.

All machined parts in all metals held to same close clearances permitting economical alloy changes in the field . . . the entire liquid end or any component as conditions warrant.

Choosing from this wide range of metals, you can combat the different corrosive actions of hot acids, alkalies, slurries, sizes, or whatever other corrosive liquids you pump.

Match pump size to job

You can get Goulds Fig. 3715 in 9 sizes: capacities to 720 GPM, heads to 200 ft. Other features of Fig. 3715: water-jacketed support head permits handling liquids at 350°F.; impeller clearance can be adjusted without dismantling the pump. For more information, write for Bulletin 725.4.



These larger pumps also fight corrosion

For larger capacities or heads, you can get these other Goulds pumps in metals that resist specific corrosion:

Fig. 3405—single stage, double suction; 19 sizes; capacity to 6400 GPM, head to 425 ft. Bulletin 721.6. Popular sizes available in 316 stainless steel from stock.

Fig. 3305—two stage, opposed impellers; 8 sizes; capacity to 1200 GPM, head to 1000 ft. Bulletin 722.6.

Fig. 3189—single stage, open impeller; 11 sizes; capacity to 1080 GPM, head to 180 ft. Bulletin 720.4.

Goulds PUMPS INC. Seneca Falls New York

Branches: Atlanta • Boston Chicago • Houston New York • Philadelphia Pittsburgh • Tulsa

West Coast Representative: Goulds Pumps Western, Portland, Ore.

In Canada: The A. R. Williams Machinery Co., Ltd. in all principal cities.

East-Southeast Construction Plans

American Oil Co. will complete a 7,600-bbl. per day Ultraformer and a 22,600-bbl. per day hydrodesulfurization (Ind.) unit at Yorktown, Va., in 1957. Ralph M. Parsons Co. is contractor. In 1958, crude capacity will be increased 25,000 bbl. per day, capacity of vacuum unit charging topped crude will be increased 16,400 bbl. per day, and a 12,000-bbl. per day straightrun asphalt unit will be completed. M. W. Kellogg is the prime contractor.

British Petroleum, Ltd., has purchased a 600-acre site at Ville d'Anjou near Montreal, Que., for a planned 30,000-bbl. per day refinery to cost over $30,000,000. Plant will include a 15,000-bbl. per day catalytic cracker, a 9,000-bbl. per day catalytic reformer, a hydrogen-treating unit, and an alkylation unit.

Canadian Petrofina, Ltd., will increase capacity at Montreal from 20,000 bbl. per day to 30,000 bbl. per day.

Commerce Oil Refining Co. is building a 30,000-bbl. per day refinery at Providence, R. I. Lummus Co. is contractor. Plant will include crude unit, catalytic cracking, catalytic reforming, catalytic polymerization, and an alkylation unit. Completion is scheduled for 1959.

Delta Refining Co. will increase crude capacity by 20,000 bbl. per day, increase capacity of vacuum unit charging topped crude by 3,600 bbl. per day, increase thermal catalytic cracking capacity by 9,500 bbl. per day (16 per cent recycle), and add a catalytic polymerization unit with 860 bbl. per day capacity at Memphis, Tenn., by December 1957.

Esso Standard Oil Co. will complete a 7,200-bbl. per day Powerformer and a 7,200-bbl. per day Hydrofining (Esso) unit at Everett, Mass., by August 15, 1957. Blaw-Knox has contract for the Powerformer.

At Linden, N. J., Hydrofining (Esso) capacity will be increased 20,000 bbl. per day, and a 20,000-bbl. per day Powerformer will be added by July 1957. Foster Wheeler Corp. has contract. A 10,230-bbl. per day sulfuric acid alkylation unit will be added by November 1957, by Ralph M. Parsons Co.

THIS MAP shows the boundary lines selected for each area. A report on refinery construction will be made on one area each month.

Gulf Oil Corp. will complete a 3,500-bbl. per day sulfuric acid alkylation unit at Philadelphia in August 1957. Ralph M. Parsons Co. is contractor. In 1958, Platforming capacity will be increased 52,000 bbl. per day. Platformer engineering and design are by Procon, Inc., and U.O.P.

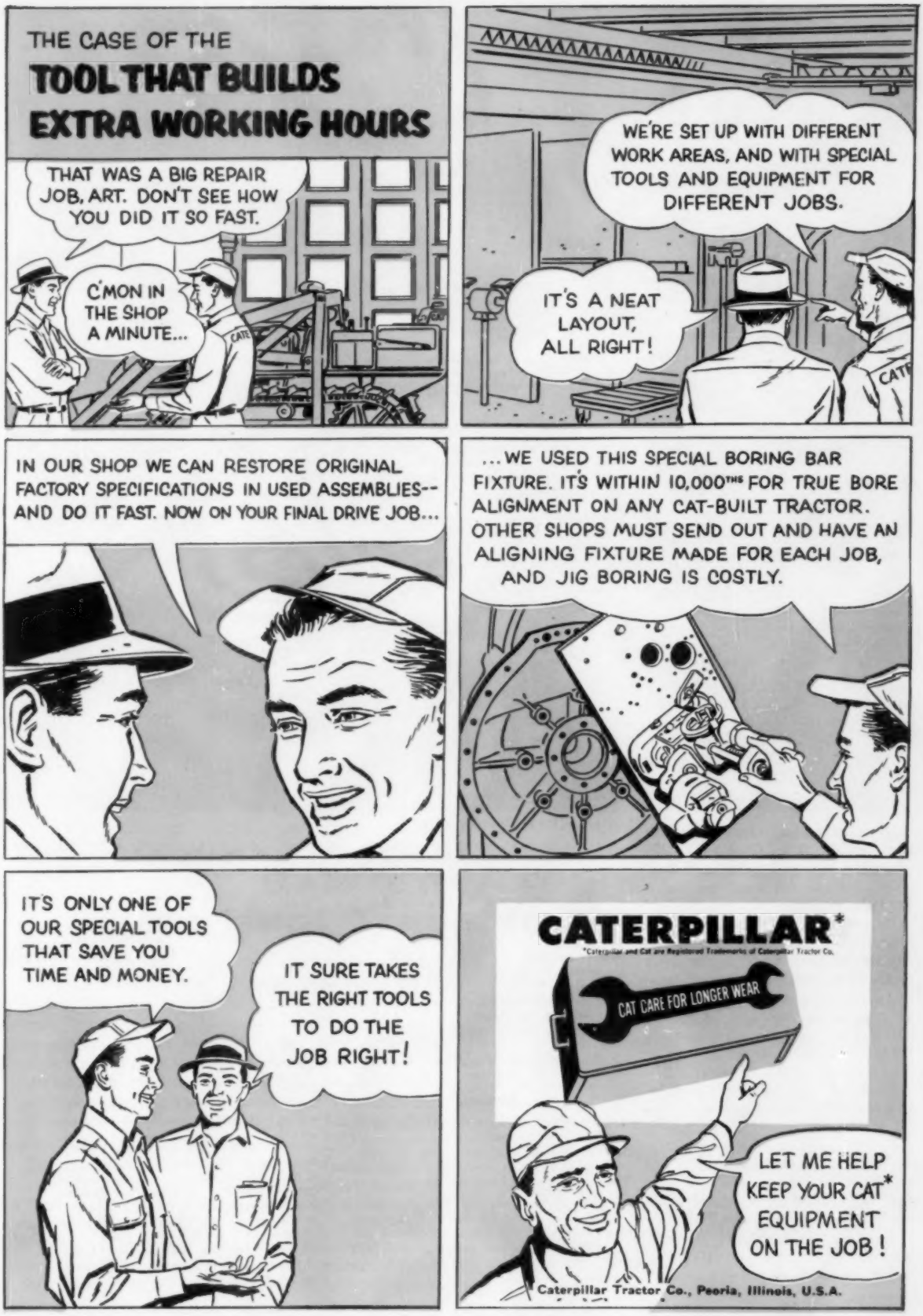
Construction of a new refinery near Charleston, S. C., is being considered. Gulf has bought over 2,000 acres and holds an option on an additional 1,000 acres. It is reported the option will be exercised soon.

Paragon Oil Co. plans a refinery at Riverton, R. I.

Shell Oil Co. of Canada, Ltd., will complete a 3,300-bbl. per day combination straightrun and oxidized asphalt unit at Montreal East, Que., in June 1957 at a cost of $1,000,000. A 1,500-bbl. per day sulfuric acid alkylation unit will be completed in 1958, by Refinery Engineering Co.

Socony Mobil Oil Co., Inc., will complete a 22,000-bbl. per day hydrodesulfurizer at Paulsboro, N. J., in July 1957. Foster Wheeler Corp. is contractor.

At Buffalo, N. Y., a 2,900-bbl. per day sulfuric acid alkylation unit will be completed in September 1957, by M. W. Kellogg Co. A 9,000-bbl. per day, $2,500,000 catalytic reformer is planned.


THE CASE OF THE
TOOL THAT BUILDS EXTRA WORKING HOURS
THAT WAS A BIG REPAIR JOB, ART. DON'T SEE HOW YOU DID IT SO FAST.
C'MON IN THE SHOP A MINUTE...
WE'RE SET UP WITH DIFFERENT WORK AREAS, AND WITH SPECIAL TOOLS AND EQUIPMENT FOR DIFFERENT JOBS.
IT'S A NEAT LAYOUT, ALL RIGHT!
IN OUR SHOP WE CAN RESTORE ORIGINAL FACTORY SPECIFICATIONS IN USED ASSEMBLIES--AND DO IT FAST. NOW ON YOUR FINAL DRIVE JOB...
...WE USED THIS SPECIAL BORING BAR FIXTURE. IT'S WITHIN 10,000THS FOR TRUE BORE ALIGNMENT ON ANY CAT-BUILT TRACTOR. OTHER SHOPS MUST SEND OUT AND HAVE AN ALIGNING FIXTURE MADE FOR EACH JOB, AND JIG BORING IS COSTLY.
IT'S ONLY ONE OF OUR SPECIAL TOOLS THAT SAVE YOU TIME AND MONEY.
IT SURE TAKES THE RIGHT TOOLS TO DO THE JOB RIGHT!
CATERPILLAR*
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
CAT CARE FOR LONGER WEAR
LET ME HELP KEEP YOUR CAT* EQUIPMENT ON THE JOB!
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

COST-imating

33. Cost of Refineries Throughout the World

By W. L. Nelson
Technical Editor

COST-IMATING No. 4 (January 2, 1956, p. 120) entitled, "Summary for Quick Cost Estimates," outlined the cost of refinery process plants in terms of the cost of the basic process equipment. The same method is continued here in outlining the cost of complete refineries as well as the cost of possible installations such as housing, radio stations, schools, etc., which are frequently needed by companies operating in a foreign country.

Situations vary so widely that only the barest information can be given, and averages are of little significance. Nevertheless, information on more than 11 foreign installations is incorporated in the tabulation on this page. In some industrialized regions the cost of refineries is only slightly above the cost of refineries in the United States but if politics is a factor, the cost rises by about 50 per cent. If, in addition, it is necessary to provide a suitable social environment as well as to accommodate political ambitions, the total cost may rise to as much as 400 per cent of the cost in the U.S.A. Part of the increased cost arises by (1) the need for more careful planning and more complete technical services, (2) the need of generating electrical power at the plant, (3) the need for greater inventories of machinery and supplies, and (4) the need for larger storage capacity.

Examination of the costs published in the news literature does not indicate as large costs as the more detailed information presented here. The costs from such sources usually do not include the cost of related housing, etc., and the extra cost appears to be about 30 per cent more than the cost of U.S.A. plants rather than the 45 per cent shown here. In a few instances the cost of foreign plants may be slightly lower than in the U.S.A. because of the availability of competent cheap labor, but exactly what caused the few low costs reported in the literature could not be determined.

Construction wage rates throughout the world as percentage of U.S.A. rates are very low:

31-60 per cent—Australia, Canada, Denmark, France, Finland, Norway, Sweden.
15-30 per cent — South Africa, Belgium, Cuba, Germany, Greece, Ireland, Israel, Italy, Netherlands, New Zealand, Puerto Rico, Switzerland, United Kingdom, Uruguay, Venezuela.
3-14 per cent—Most others.

However, more laborers are usually required and the amount of technical supervision required is usually larger. In some regions, skilled workmen must be imported for the job. Thus, labor and technical services cost about the same for foreign installations (72 to 142 per cent) as for U.S.A. plants.

BREAKUP OF THE COST OF COMPLETE REFINERY INSTALLATIONS BASED ON THE COST OF PROCESS UNITS IN THE U.S.A.

	U.S.A.	Foreign*	Footnotes
Process unit labor and services	50 (45-55)	50 (36-71)	(1)
Process material	49 (44-54)	43 (39-46)	(7)
Freight, handling and duties	1	7 (4-16)	
Extra services, etc.	...	14 (10-33)	(2)
REFINERY PROCESS UNITS COST (BASIS)	100	114 (95-148)	
Storage	16 (3-36.8)	21 (3-57)	
Loading racks, rail spurs, docks, etc.	4.7 (3.4-20.8)	13	
Docks	... (11.6-15.8)	...	
Roads and bridges	...	... (13.5)	(3)
Roads and railroads	...	... (35.9)	(3)
Dry docks (river boats)	...	... (6.7)	(3)
Buildings (offices, labs, warehouses, etc.)	10.5 (2-36)	25 (28-45)	(3)
Shops (mechanical, inst., welding and carpentry)	8.5 (6.5-12)	10 (6.7)	
Land (cost, title, surveys, drains, fencing, lights, etc.)	3.0 (0.1-62)	9	
Improvements	...	... (31)	(3)
Sewers	...	... (4.1-21)	(3)
Fire-fighting equipment	3.6 (0.2-9)	6 (7.5)	
Utilities (steam, gas, water, refrig., etc.)	21.5 (9.9-35)	29 (20.7-51)	(4)
Piping (transfer, utilities, sewers, etc.)	13.4 (10.4-46)	17 (57.5)	
Inventory (labs, warehouse, etc.)	5.9 (3-11)	17 (4-36.6)	(5)
Rigging, cranes, etc.	0.8	2	
Misc. others (royalties, etc.)	5.0	17	
COMPLETE REFINERY COST	195 (163-238)	280 (190-320)	(6)

OTHER POSSIBLE RELATED INSTALLATIONS

Radio, tele., and power	...	... (33.3)
Product handling and shipping	...	... (1.7)
Container manufacture	...	... (7.5)
Automobiles	...	... (3.3)
Ice plant	...	... (1.7)
Water, domestic	...	... (3.3)
Commissaries, cafeterias, etc.	...	... (1.1)
Housing	...	... (0-152)
Hospital and dispensaries	...	... (2.4)
Schools and recreation	...	... (2.1)
Misc. others (unaccounted)	...	... (0-360)
TOTAL REFINERY and INSTALLATIONS	200	(190-790)
TOTAL—Four refineries requiring camps	...	560 (454-790)

Footnotes

*Averages cannot be realistic but values are inserted so that a gross comparison is possible. Ranges are shown in parenthesis, and single numbers are data on only one plant or from one source.

1. Wage rates are low in foreign lands (10 to 85 per cent) but more men are used (up to 300 per cent) and the salaries and subsistence costs of imported workmen may run to 300 per cent of U.S.A. salaries.

2. More complete technical services, negotiations at long range and more overhead.

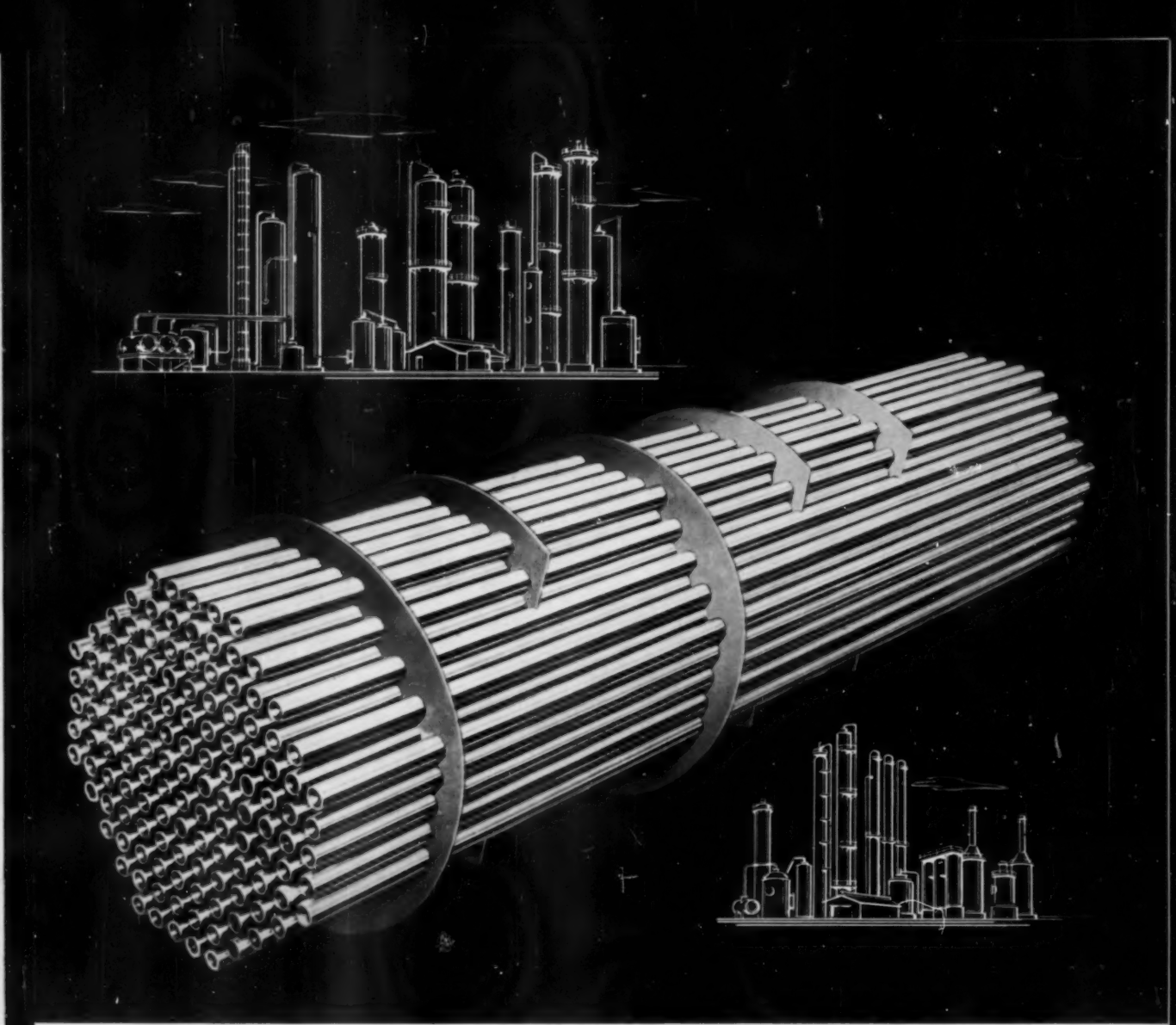
3. Part of the cost for foreign plants belongs below under special facilities.

4. Foreign plants generate own power.

5. Ranges widely between industrialized and primitive regions.

6. Published plant costs do not indicate such a high price for foreign plants.

7. Some materials are supplied locally, and some process equipment may be supplied by foreign fabricators.



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B&W ERW Tubing For Heat Transfer Equipment

When you specify B&W Electric-Resistance-Welded Carbon Steel Tubing in your heat transfer equipment, you not only have lower original cost—you are assured of savings where they count—in operating costs. Its uniform wall thickness provides high heat transfer efficiency. And dimensional accuracy from tube to tube assures easier fitting into tube sheets with less time required for rolling-in operations.

Used in oil preheaters and heat exchangers at major refineries, B&W ERW Tubing is made to ASTM and ASME specifications. It must pass rigid inspection and testing standards in manufacture. Its value has been proved in such heat transfer applications as boilers, condensers, preheaters, economizers, evaporators, and refrigeration equipment.

A call to Mr. Tubes, your nearby B&W Tube representative, will bring you economical recommendations plus quick deliveries. Write for Bulletin 412. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

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Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels.

Part 2

REFINER'S NOTEBOOK

Storage Stability

How Liquids Were Tested by W.P.R.A.

By F. G. Schwartz and C. C. Ward

THE first unique part of the W.P.R.A. program is complete representation of the major producing areas and the various types of fuels. If generalizations can be made from data obtained, they should apply to any fuel rather than to a few limited by type or source considerations.

The second unique advantage of this study is that all of the analytical work was done in bureau laboratories. Even with one laboratory doing the analyses, anomalies occur in the data, and this problem is greater whenever the services of several laboratories are used. Minimizing this variable should benefit the program materially.

Apparatus and Procedures

Storage conditions . . . The fuels were received in 55-gal. black iron drums and the refiners took special precautions to minimize deterioration en route. After receipt, the air space in the drums was purged with helium, and the drums were stored at 38° F. with a helium atmosphere above the sample. Samples for hot-room storage and all other tests were taken from these drums.

For the hot aging tests, the fuels and blends of the fuels were stored at 110° F. in vented pint glass bottles which were 80 per cent filled with sample (400 ml. of fuel).

Five bottles of each of the fuels and of the initial 60 blends were stored at 100° F. at the six conditions listed below:

1. Fuel, plus no contaminant.
2. Fuel, plus tap water, plus iron wire.
3. Fuel, plus copper wire.
4. Fuel, plus copper wire, plus sea water (synthetic).
5. Fuel, plus iron wire.
6. Fuel, plus galvanized-iron wire, plus sea water (synthetic).

An entire bottle was removed and used for analyses at intervals of 6, 13, 26, and 39 weeks. To promote breathing and replenishment of air in the bottles, the storage room was allowed to cool to about 90° F. for a 2-hour period each day.

Later supplemental blends were handled the same way but the blends were stored at condition 1 above only.

All of the blends were prepared directly in the storage bottle to insure observation of any immediate incompatibility. Instantaneous incompatibility was not observed in any case, and no incompatibility was evident within the first 3 days.

Twenty-four of the same fuels used in the 110° F. storage program were stored in 55-gal. drums, with control samples of the fuels in pint bottles. Both the drums and control samples were vented and stored at ambient temperatures, but protected from direct rays of the sun. The results from the three types of storage are compared and discussed briefly.

Analytical procedures . . . Numerous tests were made on the fuels as soon as they were received, with the hope that some of them would correlate with subsequent storage data. The tests made were:

Test—	Method
Specific gravity, 60/60° F.	Chainomatic precision specific-gravity balance
Refractive index, n_D^{20}	A.S.T.M. D1218-52T
Distillation	A.S.T.M. D158-52
Hydrocarbon-type analysis	Fluorescent indicator adsorption (A.S.T.M. D1359-54T)
Bromine number	A.S.T.M. D1159-52T
Aniline number	A.S.T.M. D611-51T
Total sulfur	A.S.T.M. D129-52
Elemental sulfur	Polarographic (1)
Mercaptan sulfur	Amperometric
Doctor test	As in D484-52 for Stoddard solvent
Light transmission, per cent	Lumetron (Appendix V, A.S.T.M. Stds. on Pet., 1949)
Corrosion, copper strip	A.S.T.M. D130-50T (3 hours at 212° F.)
Saponification number	A.S.T.M. D94-52T
Neutralization number	A.S.T.M. D974-52T
Insoluble gum	
Soluble gum	Steam-jet evaporation, 500° F. (A.S.T.M. D381-54T)
Total nitrogen	Kjeldahl
Basic nitrogen	(2)
Pyrrole nitrogen	(2)
Peroxide number	Arsenometric (Standard Oil Co., Ind.)
Infrared spectrum	

Three of the above tests were made on samples removed from storage to determine the deterioration of the fuels. These tests are described briefly below, and full details are included in a W.P.R.A. report, "Distillate-Fuel Storage Stability," which is available at $2 per copy from Western Petroleum Refiner's Association, 1428 Hunt Building, Tulsa.

Insoluble Gum

Insoluble gum was determined by filtering the entire sample through a fine-porosity fritted-disk crucible. The residue was washed with hexane and then dissolved from the crucible (with any gum adhering to the bottle) with an alcohol-acetone solvent. The solvent was evaporated and the residue from the evaporation reported as milligrams of insoluble gum per 100 ml. of fuel.

Soluble Gum

Soluble gum was determined by steam-jet evaporation of a filtered (as described under insoluble gum) sample of the fuel. The residue from steam-jet evaporation at 500° F. was reported as milligrams of soluble gum per 100 ml. of fuel.

Percentage of Light Transmission

To measure percentage of light transmission, the intensity of monochromatic light transmitted through a 20-mm. layer of sample is compared with transmission through an equal layer of distilled water,

Authors are with Petroleum Experiment Station, Bureau of Mines, USDI, Bartlesville, Okla.

BOOKS

HIGH PRESSURE TECHNOLOGY by Edward W. Comings. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36, 572 pp. $11.50.

The first book to cover the entire field of high-pressure technology this new book presents the subject at a level that can be understood by a senior student of chemical engineering. The central theme is the influence of elevated pressure on chemical and physical systems and on the design of equipment for handling these systems experimentally. Extensive appendixes supply data for problems, calculations, and design. A glossary of unusual words and terms is included.

This volume not only provides a reference and textbook for engineers and scientists who undertake industrial or laboratory work at high pressure, but also provides the chemical engineering student with a means of integrating much of the early course work.

HEATING, VENTILATING, AND AIR-CONDITIONING GUIDE 1957, Thirty-fifth Edition published by the American Society of Heating and Air-Conditioning Engineers, 62 Worth Street, New York 13. 6 by 9 in., cloth bound. $12.

The new guide has an enlarged technical data section of over 1,250 pages which represents an increase of more than 70 pages to accommodate new and revised information. The increased text is due to the steady growth in available technical information and the completion of several projects on which various technical advisory committees of the society have been engaged.

The essential features of appearance, format, and arrangement are preserved in the 1957 edition with the material contained in 51 chapters grouped into seven sections. The 24-page subject index has been revised to facilitate finding information and the 24 by 32-in. A.S.H.A.E. psychrometric chart is included.

EARTH FLEXURES by Henry Gould Busk. Published by William Trussell, Box 13 Cathedral Station, New York 25. 106 pp. $3.95.

This new book discusses definitions of folds and folding, geometrical construction of earth flexures in geological sections, the problem of locating the axial plane of folds underground, geological mapping for accurate section drawing, and examples of Tertiary flexures. Rift valley structure, as known from surface geology, is described in detail with illustrations of crescentic faults, hinge faults, and systems of echelon faults. The text is accompanied by illustrations and many geometric drawings.

1957 WHO'S WHO IN ELECTRONICS published by Electronic Periodicals, Inc., 2775 South Moreland Blvd., Cleveland 20, Ohio. 500 pp. $10.

This guide is completely revised and contains over 25,000 separate listings. It is the electronic industry's first integrated encyclopedia of procurement. Complete data on nearly 4,000 manufacturers are included plus nearly 800 manufacturers representatives listed geographically and 2,200 distributors.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

HOUDRY MINERAL KAOLIN

this improved natural catalyst now permits maximum octane to be obtained at lowest cost in Houdriflow and TCC Moving Bed Catalytic Cracking Units.

HOUDRY TYPE 3-D PLATINUM

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In line with its pioneering tradition, Houdry is today accelerating the development of new and improved catalysts for catalytic cracking and many other processes. During the past year alone, Houdry has made available a whole new line of extremely hard Alumina Base Catalysts as well as synthetic silica-alumina and other special base catalysts. Another major advance is a greatly improved natural catalyst. As a result, Houdry today offers the petroleum industry many new opportunities for increasing efficiency and reducing costs.

HOUDRY COBALT MOLYBDATE

a commercially proven, alumina base catalyst with high hardness and excellent stability and activity at low cost.

HOUDRY CHROME ALUMINA

the new catalyst developed specifically for the Houdry Dehydrogenation Process and featuring high selectivities and superior stability.

SPECIAL-PURPOSE CATALYSTS

Houdry will assist in developing custom-made catalysts for special requirements. Further information will be sent on request.

Progress through Catalysis

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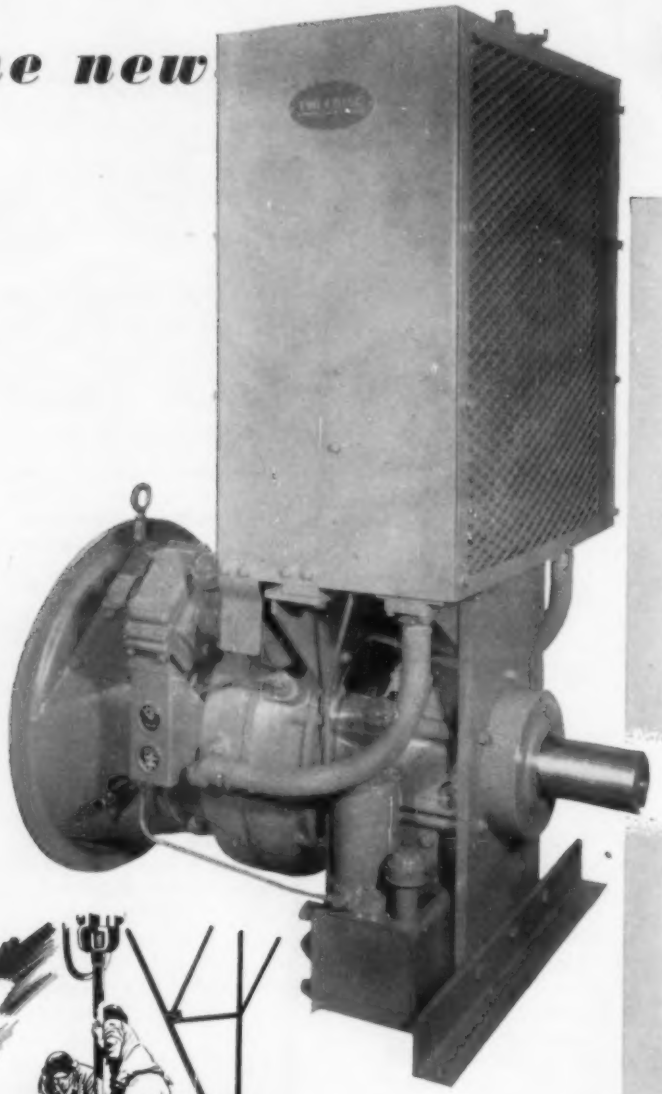
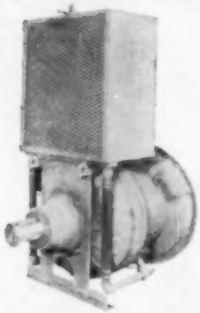
Here's the latest Twin Disc Three-Stage

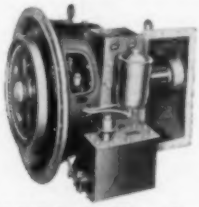
the new HEAVY-





16,000 Series Three-Stage Torque Converter

For engines rated to 1000 hp at 1500 rpm. SAE 00 flywheel housing size or clutch between flywheel and converter.



10,000 Series Three-Stage Torque Converter

From 60 hp at 700 rpm to 335 hp at 2400 rpm. SAE 1 flywheel housing size. Various input-output combinations available.

Further extending its line of three-stage torque converters, Twin Disc Clutch Company now offers the petroleum industry an additional version of its popular 11,500 Series Three-Stage Models.

Designated the Heavy-Duty 11,500 Series Torque Converter (a Standard-Duty version will be continued), the new units have a maximum rating of 586 hp at 2200 rpm. Maximum input torque is 1400 pound-feet. Impellers are available for specific torque ratings of 340, 390, 450 and 540 pound-feet.

Current production units include the Model CF, which provides a clutch at the flywheel, and the Model F, which is connected to the flywheel with a driving ring. Both types are designed for SAE No. 0 flywheel housings.

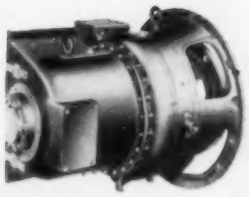
A Twin Disc C-3 Rear End, with the output shaft supported by two heavy-duty roller bearings, is available with either model, permitting maximum output sidepull. Available as optional equipment is a radiator integrally supported as a part of the torque converter.

With the addition of the Heavy-Duty 11,500 Series units, Twin Disc now offers the petroleum industry a line of three-stage torque converters with ideal matching characteristics for engines rated from 60 to 1000 hp and from 700 to 2400 rpm.

The complete line of three-stage torque converters includes five dis-

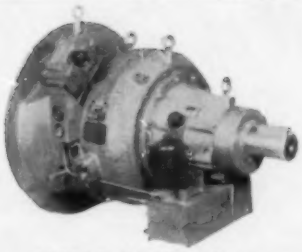
Torque Converter for oil field applications

DUTY 11,500 *Series!*



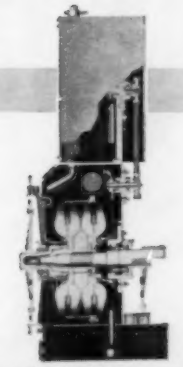
Standard-Duty 11,500 Series Three-Stage Torque Converter

From 60 hp at 700 rpm to 425 hp at 2200 rpm. SAE 0 or 1 flywheel housing sizes. Various input-output combinations.



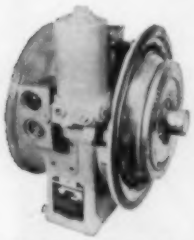
13,800 Series Three-Stage Torque Converter

To 600 hp at 1800 rpm. SAE 00 or 0 flywheel housing sizes. Spider drive or clutch between flywheel and converter.



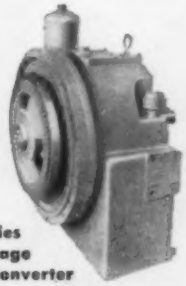
Disconnecting Fluid Power Take-Off

Model 27 for engines to 850 hp at 1525 rpm. Model 21 for engines to 580 hp at 1900 rpm. Radiator and fan standard.



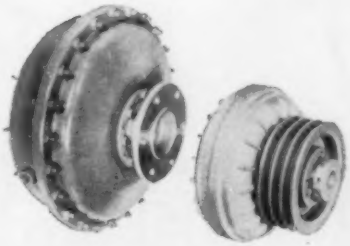
1300 Series Single-Stage Torque Converter

From 30 hp at 1450 rpm to 212 hp at 3200 rpm. SAE 2 flywheel housing size. Output adaptable to SP-111 PTO.



1500 Series Single-Stage Torque Converter

From 30 hp at 1100 rpm to 207 hp at 2500 rpm. With or without clutch. Various input-output combinations available.



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tinct sizes: the 10,000 Series, Standard-Duty 11,500 Series and Heavy-Duty 11,500 Series, 13,800 Series and the 16,000 Series. The line offers 33 specific torque ratings and input and output arrangements to meet virtually every industrial requirement.

These three-stage torque converters have long proved themselves on such applications as drilling rigs, mud pumps and many others. They offer such advantages as multiplying engine input torque (up to 6:1) exactly as required by load . . . cushioning out destructive shocks and vibrations . . . minimizing maintenance and downtime . . . and *producing more work on a hp-cost basis.*

Twin Disc also offers single-stage torque converters rated from 30 to 212 hp at speeds up to 3200 rpm for those installations where milder torque multiplication is desirable.

Twin Disc Fluid Power Take-Offs and Fluid Couplings are available to 850 hp, and are widely used throughout the oil fields where torque multiplication is not required but where the many operating advantages of fluid drive are desirable.

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Among the Drilling Contractors

Evansville Firm Sets Up Canada Offices in Calgary

L.&J. Drilling, Ltd., a subsidiary of Lohmann-Johnson Drilling Co., Inc., of Evansville recently opened Canadian headquarters in Calgary at Suite 7, Empire Building, 8th Avenue and Second Street West. H. C. Stone is manager of the company's Canadian operations.

The company has a single rotary operating in the Williston basin portion of southeastern Saskatchewan. This company's rig began operations in January and this rig has completed 10 wells since January 1.

Colorado-Wyoming Will Drill Oregon Wildcat

Colorado-Wyoming Drilling Co. has contract for Sunray Mid-Continent Petroleum Corp. and Lloyd Corp. of California 1 Kappler, this team's first try for oil in the Pacific Northwest. The wildcat will be drilled in 12-2n-2w, just west of the Columbia River about 20 miles northwest of Portland in the Holbrook area of Multnomah County. It is a 5,000-ft. test on a jointly owned 11,000-acre block.

Bagley Drilling Co., Shreveport, will handle contract for a 3,980-ft. Tuscaloosa wildcat at 1 G. H. Armstrong et al for J. A. Harper. The southwest outpost to Baskinton field in Franklin Parish, northeast Louisiana, will be drilled in 32-16n-8e. Location is about 1⅛ miles northeast of Baskinton.

Crow Drilling & Producing Co. will handle contract for Crow-Sunray 1 Hemphill, a 5,600-ft. Pettet wildcat 1⅜ miles northwest of West Lisbon field in Claiborne Parish, north-central Louisiana. The well is in C NE SE SW 12-21n-6w, 2¾ miles south-southwest of Antioch. Nearest production is in SE SW 18-21n-5w.

Crow Drilling & Producing Co. has contract for a northeast outpost to Lamar field in SW NW 6-15n-9e, Louisiana, for J. E. Marshall and M. F. McCain. The 1 Walters will seek Tuscaloosa production to 5,100 ft. Location of the wildcat is in Franklin Parish. Crow will handle contract and hold an interest in the well. Nearest production is about 3,000 ft. southwest. The well is E. M. Carpenter et al 2 Wright, 1-15n-8e, a Tuscaloosa gas well at 4,979-80 ft.

Yeatman Drilling Co. Moves to Midland

Yeatman Drilling Co., a Coleman, Tex. drilling contractor for 19 years, has moved to Midland, Tex. Witt Yeatman is owner of this company. His office manager, Joan Cathey, will be in charge of the new Midland office. Monroe Allcorn has gone to Snyder, Tex., where one of the company's rigs is operating with Glen Harmes as driller. The other company rig is in Yoakum County, Texas. M. C. Hail is in charge here.

Montgomery Drilling Co., El Dorado, Ark., will drill a 3,700-ft. Paluxy test for Murphy-Sun Oil Co. at D-16 J. E. Holt in C SW NE 29-16n-8e, east offset to production at South Big Creek field in Franklin Parish, Louisiana. Location is about ¾ mile west of Baskinton field.

Gary Drilling Co., Oil City, La., has contract for Acadian Oil & Gas Corp. 1 C. B. Winham et al, a wildcat in C NW NW NW 9-21n-13w. Location of the Tokio 3,000-ft. test is 4⅛ miles south-southeast of Plain Dealing in Bossier Parish, northwestern Louisiana. The well is 2¾ miles northeast of Cottage Grove field.

H. L. Rowley, Inc., Shreveport, has contract for Petroleum, Inc., and H. L. Rowley 1 Stanton, a wildcat in C SE NW 29-12n-11e, 1⅝ miles southeast of Justina field in Tensas Parish, east-central Louisiana. The well will seek production to 8,500 ft. Nearest production is in 19-12n-11e.

Green & Heiser Drilling Co. has contract for General Petroleum Corp.'s first wildcat well in Oregon. The 1 Long-Bell, 15 miles inland from the coast and about 12 miles northeast of Reedsport in Douglas County, is in 27-20s-10w.

H. L. Rowley, Inc., Shreveport, will handle contract for a 6,600-ft. Wilcox wildcat in Concordia Parish, east-central Louisiana. The well is Petroleum, Inc. and H. L. Rowley Special

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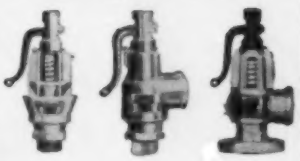

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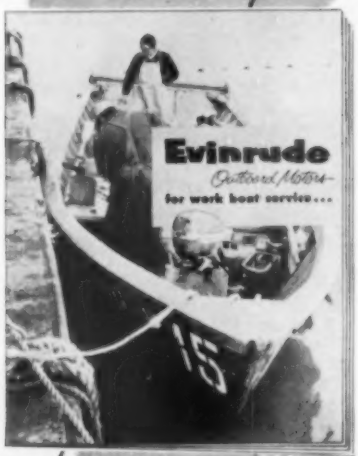

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1 Madison Oil & Development in 30-6n-8e, 3½ miles southeast of Lismore Landing field. Location is also 4½ miles northwest of Quinn Bayou field. Several Wilcox wildcats have been drilled in this immediate area.

Justiss-Mears Drilling Co., Jena, La., has contract for a 3,500-ft. Wilcox wildcat for Mobley & Stephens of Shreveport at 1 Tremont Lumber Co. in C SW SW 6-9n-2e, 1⅜ miles east of Tullos-Urania field in LaSalle Parish, Central Louisiana. The wildcat, a stratigraphic test, lies 2⅜ miles southeast of the town of Tullos, La.

Trimble Drilling Co., Magnolia, Ark., has contract for a 4,500-ft. Tuscaloosa wildcat 1⅞ miles southeast of Bryceland, La. The well, Hodge-Hunt Lumber Co., Inc. 4 Continental Can, is a west outpost to Bryceland field in Bienville Parish, northwestern Louisiana. The well is 1⅝ miles southwest of Travis Peak gas production in the field.

Lewis Drilling Co. has contract for a 5,100-ft. wildcat in southwestern Kansas. The contract is for National Cooperative Refinery Association and Durbin Bond, Inc., at 1 Brunett Estate, NW NW NE 4-22s-38w, 4½ miles northwest of Patterson pool and 16 miles north of Kendall, Kans., in Kearny County. Drilling is below 2,050 ft.

Creighton Drilling Co. is moving in tools for a contracted 6,500-ft. test in the Oklahoma Panhandle's Northeast Greenough field in Beaver County. The well is Ambassador Oil Co.'s 1 Oklahoma in SW NE SW 14-6n-22w.

Rowan Drilling Co., Fort Worth, has been awarded contract for a 16,000-ft. wildcat in Plaquemines Parish, 1 mile south of production at Bastian Bay field in South Louisiana. The well is Tidewater Oil Co. A-1 J. S. Abercrombie, 4-21s-29e.

Lohmann & Johnson Drilling Co. has contract for a 8,350-ft. pre-Cambrian wildcat east of Virginia Hills field in Alberta for Hudson's Bay Oil & Gas Co., Ltd. The new test, 1 East Virginia Hills, will be drilled on LSD 5, 31-65-6w5. Virginia Hills is 40 miles west and Swan Hills is 25 miles southwest.

Melco Drilling Co. tools are being used on a wildcat for Jocelyn-Varn Co. at 1 Smith in NE SW SW 34-8n-7e, Seminole area of Oklahoma. The company recently expanded this producing area at 1 Streater in SW SW SE 34-8n-7e. The Booch well flowed 90 bbl. of oil per hour.

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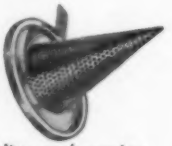

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Pipeline Patrol

...Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

- **Cape Pipe Line Co.** (organized by Sun Oil Co., Cities Service Co., Atlantic Refining Co.)

Project: Long range plans for line on the lower Delaware Bay to the Philadelphia refining area.

Status: Planned.

Completion: 1960.

- **Cosden Petroleum Corp., Onyx Div.**

Project: 37 miles of 4, 6-in. main line plus 15 miles of laterals in central and southern Taylor County, West Central Texas, to deliver to Onyx plant at Hawley, Tex.

Status: To start when weather permits.

Completion: July 1, 1957.

- **Four-Corners Pipe Line Co.** (newly formed by Shell Oil Co., Standard Oil Co. of California, Continental Pipe Line Co., Gulf Oil Corp., Richfield Oil Corp., Superior Oil Co.)

Project: 635 miles of 16-in. from Aneth field in southern Utah to Los Angeles, 86 miles of 12-in. from New Mexico's Bisti field to Red Mesa station 35 miles southeast of Bluff, Utah, and 3 miles of 6, 8, 10-in. feeder lines from other fields in New Mexico and Utah. Line will be operated by Shell Pipe Line Corp. as agent for the companies involved.

Status: Under way.

Contractor: **A. P. Vaughn Construction Co.**, Fort Worth, and **Potashnick Construction Co.**, Cape Girardeau, Mo., will jointly build 170 miles of 16-in. from Aneth field to Cameron, Ariz. **R. H. Fulton Construction Co.**, Lubbock, Tex., will build 98 miles of 16-in. from Cameron to Seligman, Ariz., and 217 miles of 16-in. from the Colorado River to Olive, Calif. Remainder not let.

Completion: End 1957.

- **Fulton, R. H. & Co.,** Lubbock, Tex.

Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.

Status: Fulton, a conctractor, has applied to Wyoming Public Service Commission.

- **Great Northern Railway Co.**

Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.

Status: Under study.

Contractor: **Pipe Line Technologists, Inc.** has contract for feasibility study to be finished July or August 1957.

- **Interstate Oil Pipe Line Co.**

Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.

Status: Proposed.

- **Magnolia Petroleum Co.**

Project: 203 miles of 12, 16, and 20-in. loops between Midland and Beaumont, Tex.

Status: To start August 1957.

Contractor: **O. R. Burden Construction Corp.** has 121 miles of 16-in. and 5 miles of 12-in. between Midland and Corsicana. **H. B. Zachry Co.** has 77 miles of 12, 16, and 20-in. between Corsicana and Beaumont.

Completion: Early 1958.

- **Muskegon Pipe Line Corp.** (newly formed by Aurora Gasoline Co. and Service Pipe Line Co.)

Project: 165 miles of 10-in. from Griffith, Ind., to Muskegon, Mich.

Status: Planned.

Completion: Late 1957.

- **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.

Status: Proposed.

- **Offshore Gathering Corp.,** Houston.

Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)

Status: Proposed.

- **Oil Field Pipe Line, Inc.**

Project: 200 miles 8 and 12-in. line from near Elkhart, to Ellinwood, Kans., at Schurr station of Arapahoe Pipe Line Co.

Status: Proposed.

- **Pasotex Pipe Line Co.**

Project: 58 miles of 20-in. between Wink and El Paso, Tex.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: September 1, 1957.

- **Salt Lake Pipe Line Co.**

Project: 100 miles of 10-in. looping of Rangely, Colo., to Salt Lake City line.

Status: Pipe has been ordered.

Completion: Late 1957.

- **Shamrock Oil & Gas Corp.**

Project: 35 miles of 6-in. to serve fields in Ochiltree and Hansford counties in the Texas Panhandle.

Status: Under way.

- **Shell Oil Co.**

Project: Undetermined length of 3, 4-in. in South Louisiana.

Status: Under way.

Contractor: **Brown & Root, Inc.,** W. P. Stanley, spread superintendent, office at Buras, La.

Completion: September 30, 1957.

- **Sinclair Pipeline Co.**

Project: 150 miles of 20-in. from Teague, Tex., to Houston.

Status: Planned for 1958.

Completion: 1958.

- **Skelly Oil Co.**

Project: 38 miles of 8-in. extension of its gathering system into southern Kiowa County, Kansas.

Status: Planned.

Completion: Early fall 1957.

- **Southern Kansas Pipeline, Inc.** (newly organized).

Project: 200 miles of 6 to 10-in. from southwestern Meade County to a point in Cowley County, 10 miles north of Arkansas City.

Status: Proposed. Request filed with Kansas Corporation Commission for permit.

- **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)

Project: 201 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.

Status: Under way.

Contractor: **O. R. Burden Construction Corp.** has two spreads of 93 miles from Griffith eastward and 92 miles from the

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mid-point to Cygnet. The 16 miles from Chicago to Griffith has not been let.

Completion: September 1957.

- **Texas-New Mexico Pipe Line Co.** (owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co.)

Project: 515 miles of 16-in. from southeast corner of Utah to Jal in southeastern New Mexico.

Status: To start late 1957.

Contractor: Survey contracts went to **J. V. McCoy**, Houston, and **E. H. Schmidt and Associates**, Tulsa.

Completion: 1958.

U.S. Products Pipelines

- **Alaska-Yukon Refiners & Distributors, Ltd.**

Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on the Canol line, to Anchorage.

Status: Proposed.

Completion: 1959.

- **American Pipe Line Co.**

Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.

Status: Proposed.

- **Buckeye Pipe Line Co.**

Project: Conversion of 116 miles of 8-in. crude to products between Huntington, Ind., and Griffith, Ind.

Status: under way.

Contractor: **Sheehan Pipe Line Construction Co.**, C. M. Brown, superintendent, office at Rochester, Ind.

Completion: July 10, 1957.

Project: Conversion of 32 miles of 8-in. crude to products between Mantua, Ohio, and Youngstown area.

Status: Planned.

Contractor: Company will do own work.

Completion: November 1957.

Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.

Status: Under way.

Completion: Early 1958.

- **Cities Service Pipe Line Co.**

Project: 29 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.

Status: Planned.

Completion: July 31, 1957.

Project: 168 miles of 6-in. L.P.G. line from East Chicago, Ind., to Lowell, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.** has 98 miles from Lowell to South Bend, Ind., Robert Hively, spread superintendent, office at Ada, Mich.

Completion: September 1, 1958.

- **Continental Pipe Line Co.**

Project: Conversion of 99 miles of 6-in. from the Wichita Falls area to near Fort Worth, Tex., plus a 15-mile extension of the line to the Grapevine area northeast of Fort Worth.

Status: Conversion under way. Extension planned.

- **El Paso Natural Gas Co.**

Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant, Texas.

Status: Planned

Project: 240 miles of 6-in. from Odessa to El, Paso, Tex.

Status: Planned.

Contractor: **Pipeline Engineering Co.** has design and engineering contract. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contracts.

Completion: Early 1958.

- **Florida Pipeline & Storage Co.**

Project: 67-mile products line from Everglades, Fla., to Homestead Air Force Base, 25 miles south of Miami.

Status: To start in summer.

Contractor: **Fish Service Corp.**

Completion: December 1957.

- **Great Lakes Pipe Line Co.**

Project: 84 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.

Status: Under way.

Project: 15 miles of 6-in. from Lincoln, Neb., to Lincoln air base.

Project: 140 miles of 8-in. from Minneapolis to Superior terminals.

Project: 34 miles of 12-in. from Tulsa to Barnsdall, Okla., to supplement existing 12 and 8-in. lines.

Project: 14 miles of 8-in. from Coffeyville to Independence, Kan., to replace present 4-in line.

Project: 11 miles of 8-in. from approximately 10 miles east of the Great Lakes pumping station at Donahue, Iowa, to terminals on the Mississippi River at Bettendorf, Iowa.

- **Laurel Pipeline Co.** (Gulf Refining Co., Sinclair Pipe Line Co., and The Texas Co.)

Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at the west terminus, from Philadelphia refining area to Cleveland.

Status: To start early 1958.

Completion: 1958.

- **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project: 80 miles of 8-in. and 300 miles of

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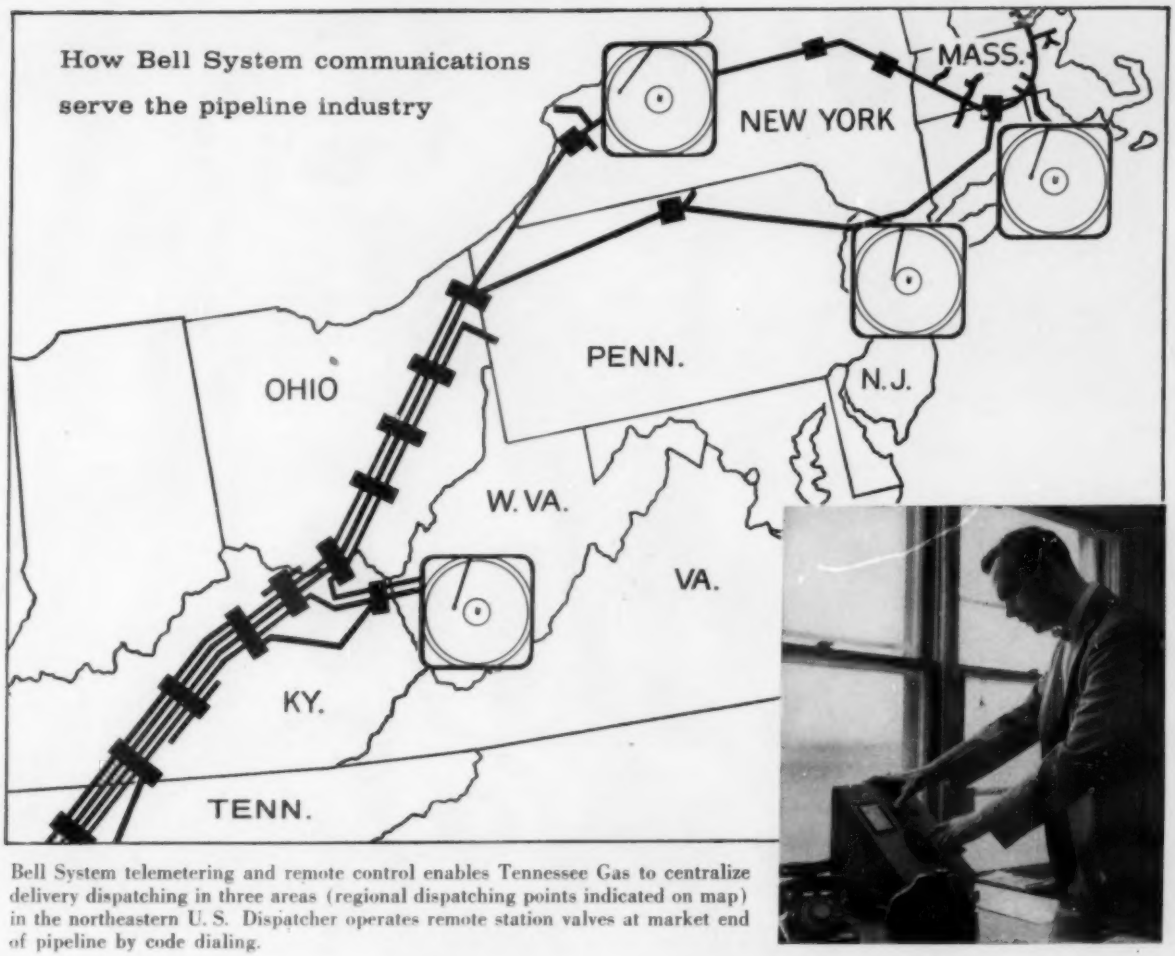

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SPECIFICATIONS

Type of backing	Polyethylene Black
Thickness in Mils	13
Tensile Strength lbs./in.	25
Elongation % at Break	100
Adhesion oz./in. minimum	35
Insulation Resistance Megohms	1,000,000
Dielectric Strength Volts	15,000
Electrolytic Corrosion Factor	1.0
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ROLLS: 100 ft. long: Widths: 1" and multiples of 1"

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Pipeline Patrol

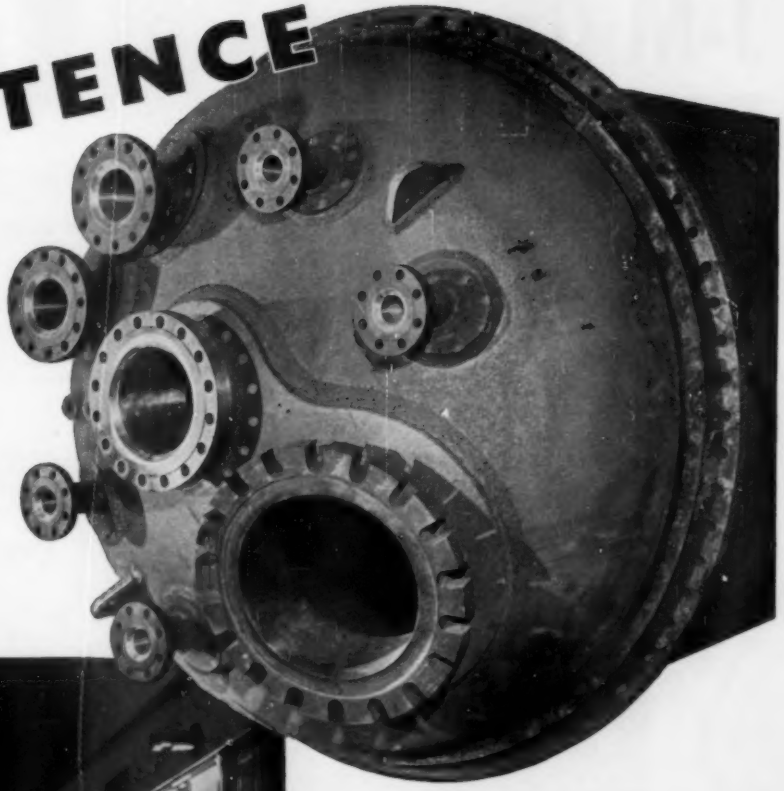
10-in. products and crude line from Four Corners area to Salt Lake City.
Status: Proposed.

- **Ohio Oil Co.**
  Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.
  Status: Work to start fall 1957.
  Completion: 1958.
- **Salt Lake Pipe Line Co.**
  Project: 80 miles of 8-in. looping of line from Boise, Idaho, to Pasco Wash.
  Status: Pipe has been ordered.
  Completion: Late 1957.
- **Southern Pacific Pipe Lines, Inc.**
  Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
  Status: Under way.
  Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif., to complete July 15, 1957. **Hood Construction Co.,** Lynwood, Calif., has 58 miles of 10-in. from Stockton to Roseville, Calif. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 180 miles of 6 and 8-in. between Rocklin, Calif., and Fallon, Nev.
  Completion: August 1, 1957.
- **Trust Pipe Line Co.** (Cosden Petroleum)
  Project: 128 miles of 6-in. from Hawley, near Abilene, to Wichita Falls, Tex.
  Status: To start July 1957.
  Contractor: **Pipe Line Technologists, Inc.,** has the design and engineering.
  Completion: October 1957.
- **Underground Storage & Exploration, Inc.**
  Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
  Status: Proposed.
- **Union Oil Co. of California**
  Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
  Status: Proposed.

U.S. Natural-Gas Pipelines

- **American Louisiana Pipe Line Co.**
  Project: 7 miles of 16-in. and 5 miles of 12-in. at North Holly Beach Field and Second Bayou Field, Cameron Parish, La.
  Status: Has temporary FPC permit.
- **Arkansas Louisiana Gas Co.**
  Project: A 300-mile line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system, plus gathering lines.
  Status: Long-range plans.
- **Atlantic Seaboard Corp.**
  Project: 14 miles of 26-in. looping in Hardy and Randolph counties, West Virginia.
  Status: Has temporary FPC approval.
- **Carolina Pipeline Co.**
  Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden, S. C.
  Status: Under way.
  Contractor: **Panama-Williams Corp.** has construction contract. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.
- **Central Hudson Gas & Electric Corp.**
  Project: 46 miles of 10-in. from Albany to Kingston, N. Y.
  Status: Under way.
  Contractor: **Williams-Austin Construction Corp.,** O. L. Martin and Ralph Gaddy, spread superintendents, office at Catskill, N. Y.
  Completion: November 1, 1957.
- **Cities Service Gas Co.**
  Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.

COMPETENCE



Head of a 6 ft. dia. Autoclave spun on the Harvey "Rotarpress" from a stainless steel disc 1⅝ in. thick.

Designed for a working pressure of 500 lbs./sq. in.

VIGILANCE

KEYNOTES OF

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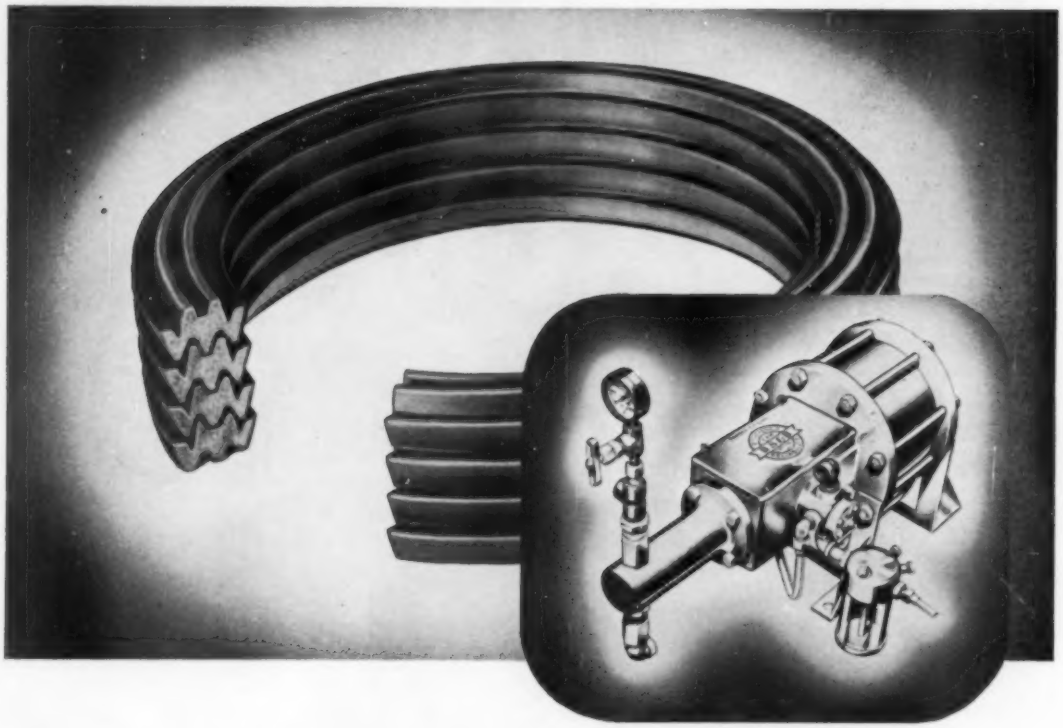
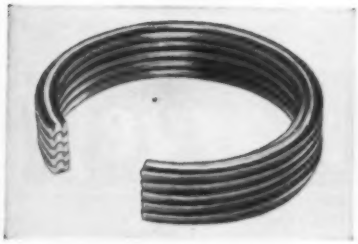
J-M Uneepac® does it again!



"Very satisfactory sealing service against wide variety of fluids and pressures up to 5,500 psi"

says Black, Sivalls and Bryson, Inc. makers of BS&B Glycol Pump



Uneepac comes in two types. Shown here is design for flange widths up to ½" which is used in BS&B Glycol Pump. Large illustration above shows design for flange widths over ½".

Chalk up another success story for Uneepac—Johns-Manville's automatic ring packing. In the BS&B Glycol Pump, fluids handled include triethylene glycol, diethylene glycol, gasoline, and various types of oils, alcohols and petroleum treating chemicals. Working pressures range from 125 psi to 5,500 psi with average operating pressures at 3,000 psi. Yet despite these rugged service conditions, Uneepac has delivered—in Black, Sivalls and Bryson's own words—"very satisfactory service."

Many other packing users have acclaimed J-M Uneepac for its long, trouble-free service. Each ring is a complete packing unit. Fewer rings are needed than ordinarily required and stuffing box size can be reduced to the minimum. Each ring centers itself automatically on the preceding ring to simplify installation. This exclusive design also permits fluid pressure to act upon each lip individually and protects lips from excessive gland pressure.

J-M Uneepac comes in a wide range of styles and sizes for many rod and plunger applications. For further information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

Johns-Manville PACKINGS, GASKETS and TEXTILES

Pipeline Patrol

Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 3 miles of 12-in., 8 miles of 10-in. 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 4 miles of 16-in. at Sarcoxie, Mo
Status: Approved. Under way.
Contractor: **Prairie Construction Co.**
Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kansas, Cass County, Missouri. and Oklahoma County, Oklahoma.
Status: Planned.
Project: 75 miles of 30-in. from Independence to near Welda, Kan.
Status: Pending FPC approval.

- **Coastal Transmission Corp.**

Project: 575 miles of 12, 20, 22, 24-in main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: To start summer 1957.
Completion: January 1, 1958.

- **Colonial Natural Gas Corp.**

Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

- **Colorado Interstate Gas Co.**

Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval. Has temporary approval for the 50-mile, 22-in. section in Oklahoma.

- **Eastern Shore Natural Gas Co.**

Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp. in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.

- **East Ohio Gas Co.**

Project: 90 miles of 24-in., and 23 miles of 30-in. from Richfield to Summerfield, Ohio.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, James Adams, spread superintendent, office at Wadsworth, Ohio.
Completion: November 1957.

- **El Paso Natural Gas Co.**

Project: 74 miles of 34-in. San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: August 1957.
Project: 94 miles of 18-in. from Panoma Plant, Gray County, to Dumas Plant, Moore County, Texas.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: July 1957.
Project: 177 miles of 20-in. from Sonora Plant, Sutton County, to Plains Plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 74 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 216 miles of 6 to 34-in. in Arizona, Texas, and New Mexico, plus 533 miles of various size line.
Status: Filed for FPC permit.
Project: 47 miles of 30-in. from proposed Lindrith, N. M., plant to proposed Chaco, N. M., plant.

W-S Forged Steel Unions

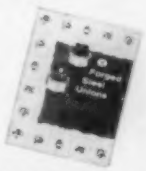
. . . these features tell the difference . . .

Not all forged steel fittings are alike. Careful design and precision manufacture give W-S Forged Steel Unions these important features that tell the difference:

1. Designed to AAR dimensional specifications.
2. Steel-to-steel seats, with spherical-to-angle mating surfaces. Angle is rolled to extra hardness to resist galling.
3. Cadmium plated nuts for resistance to corrosion and to galling and siezing.
4. End pieces protected against rust by new W-S blue synthetic coating.
5. Octagonal end pieces for better gripping.

W-S Unions are machined from forged steel in accordance with ASTM material specifications A-105, Grade 2. They are available with screw-end and socket-welding end pieces in 3000 lb. class, sizes ⅛″ to 3″.

For complete information send for Bulletin U-1. Write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.



HKP W-S FITTINGS DIVISION
H. K. PORTER COMPANY, INC.

Pipeline Patrol

Status: Under way.
Contractor: **Foutz & Bursum Construction Co.**
Completion: 1957.
Project: 38 miles of various size line to make additional gas available for processing at the McElroy-Wilshire gasoline plant (recently purchased from Lone Star Producing Co.) near Crane, Tex.

• **Houston Texas Gas & Oil Corp.**
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 240 miles of 18-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.
Status: Under way.
Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.
Completion: June 1958.

• **Illinois Power Co.**
Project: 6 miles of 6-in. line between Hoffman and Carlyle, Ill., plus distribution lines.
Status: Under way.
Contractor: **Mid-States Construction Co.**, H. A. Hane, spread superintendent, office at Carlyle, Ill.
Completion: September 1, 1957.

• **Iron Ranges Natural Gas Co., St. Paul.**
Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**
Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.
Status: Approved.

• **Manufacturers Light & Heat Co.**
Project: 50 miles of 10, 12-in. from Waynesburg to Pittsburgh, Pa.; 40 miles of 16-in. and 20 miles of 6 to 12-in. from Corning to Dundee, N. Y.
Status: 50-mile section under way; remainder to be started July 15, 1957.
Contractor: **Harford Brothers**, A. M. Harford and Robert Mann, superintendents.
Completion: 50-mile section to be completed July 15, 1957; remainder September 15, 1957.

• **Michigan Consolidated Gas Co.**
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.**; Floyd Huduall, spread superintendent, office at Cadillac, Mich.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.**, jointly with **J. L. Gentry Construction**; Frank Morris, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**
Project: 24 miles of 24-in. and 18 miles of various size looping in Michigan, Indiana, Illinois, Wisconsin, Iowa, and Missouri.
Status: Approved.
Completion: October 1, 1957.

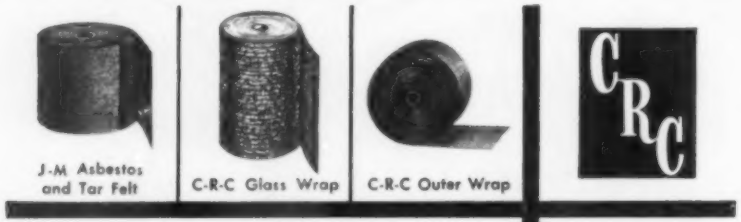
• **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

• **Missouri Natural Gas Co.**
Project: 25 miles of 2, 4, 6-in. distribution lines to towns of Herculaneum, Pevely, and Hemetite, Mo.
Status: Under way.
Contractor: **Mid-States Construction Co.**, H. A. Hane, spread superintendent, office at Festus, Mo.
Completion: June 30, 1957.

• **Montana-Dakota Utilities Co.**
Project: 28 miles of 12-in. from Fallon County to Dawson County, Montana.
Status: Approved.
Project: 6 miles of 12-in. between Mandan and Bismarck, N. D.
Status: Has temporary approval.

• **Mountain Fuel Supply Co., Salt Lake City**
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., plus a gathering system.
Status: Under way.
Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County. **Fulton & Brodie, Inc.**, Lubbock, Tex., has gathering system. **Eastern Pipeline Contractors**, Dallas, has 80 miles of 20-in. from Bridgeport, Tex., to Healdton, Okla. Remainder not let.
Completion: Total project to be completed by December 1, 1957.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.
Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of



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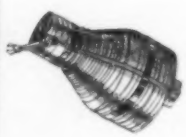
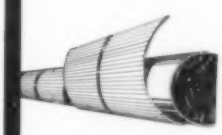

Casing Seals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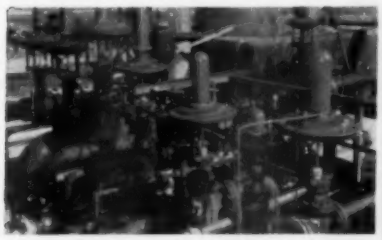
Silicone News

FOR PETROLEUM MEN — No. 1

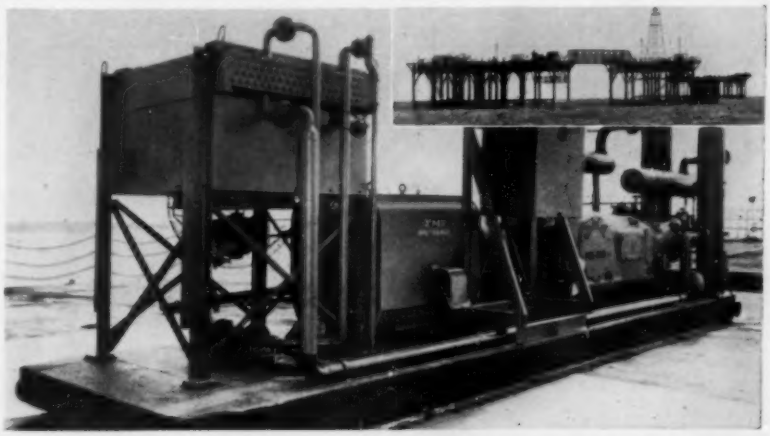
SILICONE VALVE LUBRICANT SEALS, PREVENTS CORROSION

Dow Corning Valve Seal A improves the performance and increases the life of valves handling a variety of corrosive chemicals and gases. Effective from —40 to 500 F, it provides a durable seal and protects valve stems against corrosion.

In fact, Dow Corning Valve Seal A has proved so dependable in such service that Foxboro Co. engineers now offer their Stabilflo line equipped with an isolating valve and lubricator for injecting the silicone lubricant. Excellent results, particularly in reduced maintenance, have



been obtained with silicone lubricated Stabilflo valves handling steam, water, oxygen, gasoline, light hydrocarbons, natural gas, chlorine, hydrochloric acid, cold sulfuric and nitric acids, and ammonia. To receive a free trial sample of Dow Corning Valve Seal A, circle .... *No. 3*



Silicone Insulation Eliminates Need for TEFC Motors in Tidelands Oil Operations; Saves $3,000 per Unit!

A typical example of good modern practice is the silicone insulated compressor motor operating on one of the California Company's fixed oil well platforms in the Gulf of Mexico.

Built by Electric Machinery Mfg. Co., Minneapolis, this 300 hp, 900 rpm induction motor is exposed to the most severe weather the Gulf can produce. Installed over 2 years ago, the unit still is in excellent operating condition.

The windings of this "Sil-Clad" motor are insulated with Dow Corning silicone resins, silicone resin-impregnated components, and a tape made with Silastic,* the Dow Corning silicone rubber. Outer protection is provided by a steel housing coated inside and out with a silicone based paint.

According to Electric Machinery, this "Sil-Clad" motor is more reliable and more resistant to corrosion than conventional Class A or B totally enclosed, fan cooled motors of the same rating. And it cost $3000 less than a comparable TEFC motor built with ordinary insulating materials. Lower initial costs combined with greater reliability and lower maintenance costs account for the rapidly increasing market for such motors. *No. 1*

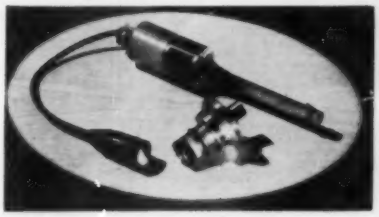
*T M REG U S PAT OFF

Silicone Compound Seals Electrical Connections, Scorns Heat and Pressure

Dow Corning Silicone compounds retain their grease-like consistency from —40 to 400 F, exclude moisture, reduce corrosion and serve as an auxiliary dielectric and lubricant.

Here's a highly specialized application from the oil fields. The Lane-Wells Company of Los Angeles solved the problem of connecting a power line to the various survey tools that are lowered into oil wells by attaching a contact block to an insulated copper conductor carried inside a steel cable.

The remaining problem was to protect the contact block connection against the high temperatures and well-fluids under pressures encountered in drilling oil wells. That was solved by placing a neoprene sleeve filled with a Dow Corning silicone compound over the cable core and the contact block. The silicone compound retains its consistency under heat and pressure and excludes moisture, assures reliable operation. *No. 2*



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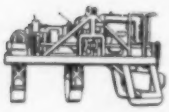
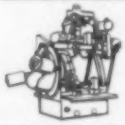
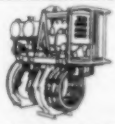
stationary coating & wrapping machine

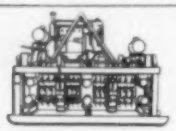

road boring machine

Cinch hydraulic pipe bending machine

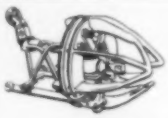

line traveling coating & wrapping machine


line traveling cleaning & priming machine

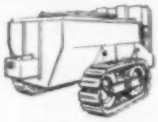
pipeline cradles


stationary cleaning & priming machine

pipe cutting & beveling machine


internal line up clamp

ditch padder


pipeline kettles

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Pipeline Patrol

36-in. between Beatrice and Joilet, Ill., along Natural's existing system from the Texas Panhandle to Chicago.

Status: Pending FPC approval.

Completion: 1959.

- **New York State Natural Gas Corp.**

Project: 15 miles of 30-in. from Horseheads to Newfield, N. Y.; 31 miles of 20-in. from Harrison to Woodhull, N. Y.; 10 miles of 12-in. from Stockbridge to Oneida, N. Y.

Status: Planned.

Project: 12 miles of 12-in. near Oneida, N. Y.

Status: To start September 15, 1957.

Contractor: **Harford Brothers,** A. M. Harford and Robert Mann, superintendents.

Completion: October 15, 1957.

- **Niagara Mohawk Power Corp.**

Project: 14 miles of 18-in. from Phoenix to Palermo, N. Y.

Status: Planned.

Completion: October 1, 1957.

Project: 261 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York state.

Status: Planned.

Contractor: Various.

Completion: December 31, 1957.

- **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)

Project: 630 miles of 2 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.

Status: To start fall 1957.

Completion: Spring 1958.

- **Northern Natural Gas Co.**

Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.

Status: Under way.

Contractor: **Troth Construction Co.**

Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Planned.

Project: 365 miles of main line and 1,090 miles of branch lines to serve communities in Minnesota, Iowa, South Dakota, Nebraska, and Wisconsin.

Status: Filed with FPC March 18, 1957

Project: 13 miles of 16-in. to replace existing 10-in. line in Hansford County, Texas.

Status: Has temporary FPC authority.

- **Offshore Gathering Corp., Houston.**

Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

- **Ohio Fuel Gas Co.**

Project: 11 miles of 18-in. and 11 miles of 20-in. from Gibsonburg, Ohio to Toledo; and 30 miles of 24-in. looping from Pavonia to Attica, Ohio.

Status: Pending FPC approval.

Project: 152 miles of line in Ohio: 43 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.

Status: Under way.

Contractor: **O. R. Burden Construction Corp.** has the 43 miles of 24-in. from Sugar

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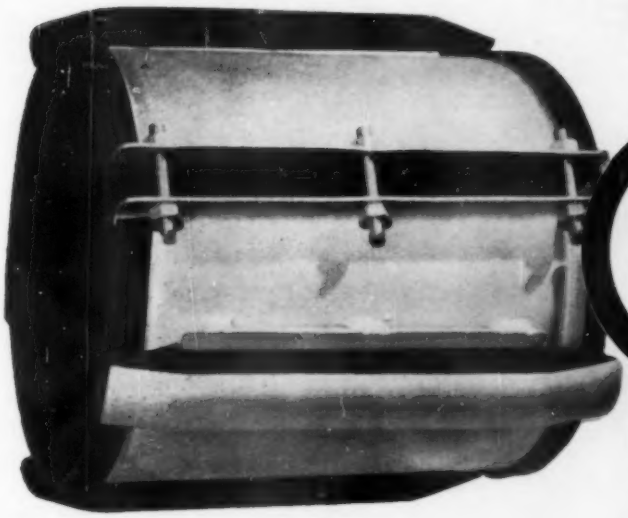

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These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the Neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip.

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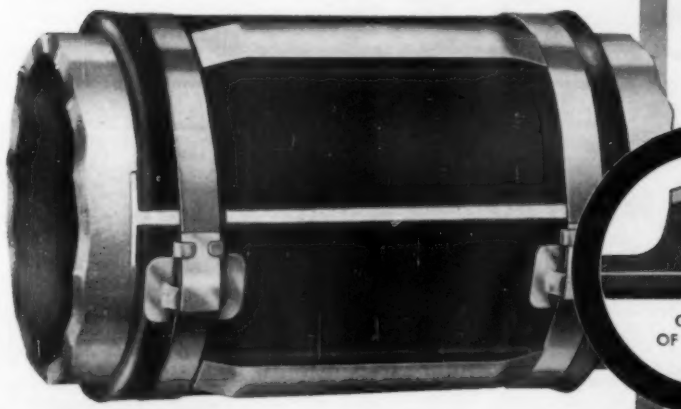

THE MALONEY MODEL 56 CROSSING INSULATOR 2" TO 12"

Manufactured with Neoprene, which is vulcanized to steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with Neoprene.

Shipped flat, the Insulator is banded to the carrier pipe with stainless steel bands.

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Pipeline Patrol

Grove near Crawford station, to Utica, Ohio, C. M. Hoffman, spread superintendent.

Completion: O. R. Burden Construction Corp., section to be completed July 1, 1957. Remainder to be completed second half 1957.

• **Pacific Gas & Electric Co.**

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: **Midwestern Constructors, Inc.**

Completion: December 1, 1957.

Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 6-in. from Corning to Eureka, Calif., to connect company's Humboldt Division with integrated gas system.

Status: Planned.

Completion: January 1958.

Project: 13 miles of 12-in., 2 miles of 10-in., from Santa Cruz to Davenport, Calif.

Status: Planned.

Completion: October 1957.

• **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.

Status: Has FPC permit.

Project: 1,000 miles of gathering lines and laterals along present line.

Status: Planned.

Completion: 1957.

Project: 35 miles of 4, 6-in. laterals from its 26-in. line in Snohomish County, Washington; 5 miles of 3-in. lateral from its Uravan lateral line to Union Carbide Nuclear Co.'s plant at Slick Rock, Colo.; 41 miles of 6-in. from its Coeur d'Alene lateral to a metering station near Kellogg, Idaho.

Status: Filed with FPC May 29, 1957.

• **Pennsylvania Gas Co.**

Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pennsylvania, 30 miles of branch lines and a number of small distribution systems.

Status: Has FPC permit.

• **Peoples Natural Gas Co.**

Project: 58 miles of 2 to 14-in. extension and replacement lines in Pennsylvania.

Status: Under way.

Completion: September 1957.

• **Permian Basin Pipeline Co.**

Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.

Status: Has temporary FPC approval.

• **Phillips Petroleum Co.**

Project: 3 miles of 24-in. in Moore County, Texas.

Status: Planned.

Completion: October 1, 1957.

Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Texas, and in Texas County, Oklahoma.

Status: Planned.

Contractor: Various.

Completion: January 1, 1958.

• **Piedmont Gas Co., Hickory, N. C. (Parent is Carolina Natural Gas Corp.)**

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Has FPC approval.

• **Pioneer Gathering System, Inc.**

Project: 70 miles of mostly 16 and 12-in. in Val Verde, Schleicher and Sutton counties, Texas.

Status: Under way.

Competion: Early fall 1957.

• **Signal Oil & Gas Co.**

Project: 80 miles of gathering lines serving Tioga, N. D., gasoline plant; system being extended to Antelope, North Blue Buttes, and South Blue Buttes fields, McKenzie County, North Dakota.

Status: Under way.

Contractor: **C. P. Bartley & Son**, Tioga, N. D.

Completion: October 1, 1957.

• **Southern California Edison Co.**

Project: 200-mile line from San Joaquin Valley gas fields to power plant at Redondo Beach, Calif.

Status: Under way.

Completion: 1957.

• **Southern California Gas Co. and Southern Counties Gas Co. of California.**

Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.

Status: Under way.

Contractor: **R. H. Fulton & Co.**, spread offices at Palmdale and Barstow, Calif.

Completion: June 30, 1957.

Project: 4 miles of 30-in. from Los Angeles River to Victoria Station at Los Angeles.

Status: Planned.

Completion: July 30, 1957.

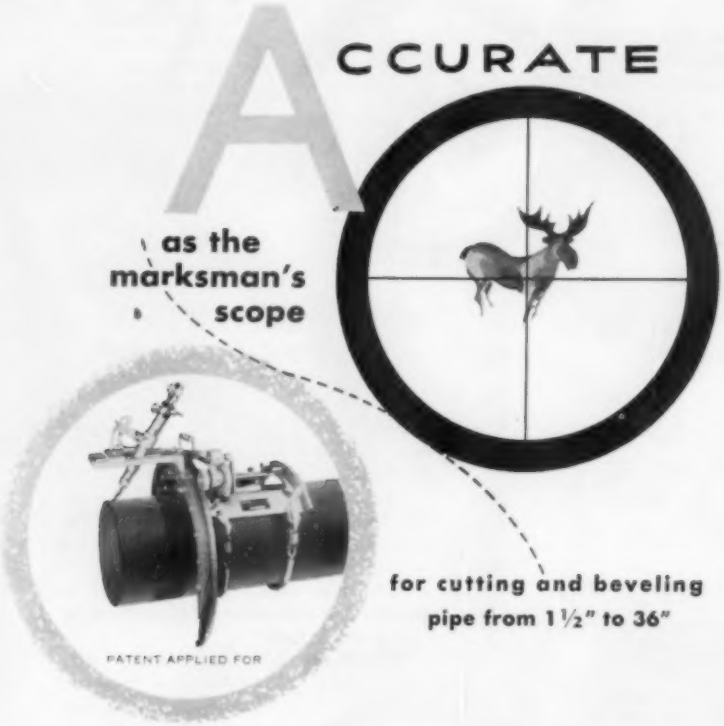
• **Southern Natural Gas Co.**

Project: 10 miles of 8-in. laterals in Napoleonville Field and Fort Jackson Field, La.

Status: Has FPC approval.

Completion: December 1, 1957.

Project: 32 miles of 6-in. from Chandeleur Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field; 7 miles of 8-in. laterals in Manila Village Field.



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Pipeline Patrol

Status: Plan to apply for FPC permit.
Completion: December 1, 1957.

• **Spokane Natural Gas Co.**
Project: 400 miles of 1 through 24-in. distribution system at Spokane.
Status: Under way.
Contractor: **Hallmac Construction Co.**; V. L. Williams, spread superintendent, office at Spokane.
Completion: 1957.

• **Tennessee Gas Transmission Co.**
Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.
Status: Pending FPC approval.
Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.
Status: Has temporary FPC approval.
Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.
Status: Pending FPC approval.
Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.
Status: Pending FPC approval.

• **Texas Eastern Transmission Corp.**
Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.
Status: Has FPC approval.
Project: 97 miles of 30-in. loops between Kosciusko, Miss., and Uniontown, Pa., and 40 miles of 10-in. laterals.
Status: Filed for FPC permit March 15, 1957.
Completion: September 1, 1957.
Project: 667 miles of 30-in. from Kosciusko, Miss., to Uniontown, Pa.

Contractors: **H. C. Price Co.** has 64 miles from Barton, Ala., to Mt. Pleasant, Tenn., 51 miles from Mt. Pleasant to Gladevile, Tenn., 52 miles from Gladeville to Tompkinsville, Ky., 68 miles from Tompkinsville to Danville, Ky., 63 miles from Danville to Owingsville, 46 miles from Owingsville to Wheelersburg, Ohio. (Four spreads will be used). **Williams Brothers Co.** has 63 miles from Egypt, Miss., to Barton, Ala., 64 miles from Berne, Ohio, to Uniontown, Pa. **Houston Contracting Co.** has 80 miles from Kosciusko, Miss., to Egypt, Miss., 57 miles from Wheelersburg to Athens, Ohio, 61 miles from Athens to Berne, Ohio.
Completion: Fall 1957.
Project: 15 miles of 6-in. from Huxley gas field to Joaquin, Tex.
Status: Under way.
Contractor: **Joe Titsworth**, Kilgore.
Completion: July 1, 1957.

• **Texas Illinois Natural Gas Pipeline Co.**
Project: 10 miles of 36-in. to loop existing single 30-in. near Joliet, Ill.
Status: Has FPC approval.

• **Transcontinental Gas Pipe Line Corp.**
Project: 172 miles of 36-in., 68 miles of 30-in., 162 miles of 24-in., and 64 miles of smaller diameter pipe to loop main line from Texas to New Jersey.
Status: Work in North Carolina under way.
Contractor: **Western Construction Co.** has 65 miles of 36-in. and 45 miles of 30-in. at scattered spots along the system in South Carolina, North Carolina, Pennsylvania, and Virginia. Western will start work in North Carolina, spread office at Winston-Salem.
Completion: Total project to be completed December 1957.
Project: 110 miles of 36-in., 16 miles of 30-in., and 13 miles of 24-in. looping in S. Car., Ga., Ala., Miss., and La.
Status: Under way.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, E. D. Singleton, superintendent.
Completion: November 1957.
Project: 29 miles of 16-in. lateral off the coast of Cameron Parish, La., and extending to company's existing system near Lake Charles.
Status: Approved. Under way.
Contractor: **Sharman Allen, Gay & Taylor, Inc.**, J. B. Robbins, superintendent, office at Orange, Tex.
Completion: July 15, 1957.
Project: 57 miles of main line in Louisiana, Mississippia, Alabama, Georgia, and South Carolina, and 226 miles of laterals in Texas and Louisiana.
Status: Filed for FPC permit, May 3, 1957.

• **United Gas Pipe Line Co.**
Project: 40 miles of 8-in. from Baldwin County, Alabama, to Container Corp.'s plant.
Status: Has FPC permit.

Canadian Crude-Oil Pipelines

• **Act Oils, Ltd.** (subsidiary of Canada Southern Petroleums, Ltd.)
Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.
Status: Request has been made for permit from the B. C. government.

• **B-A Alberta Pipe Line, Ltd.**
Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.
Status: Pending approval.

• **Interprovincial Pipe Line Co.**
Project: 156 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.
Status: Under way.

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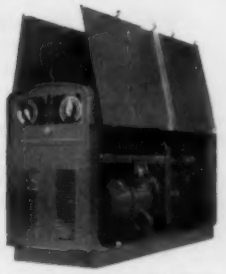

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Pipeline Patrol

Contractor: **Robert Somerville Co., Ltd.** and **Sheehan Constructors of Canada, Ltd.** have 90 miles from Sarnia to Bright, Ont., Jim Brown, superintendent, office at Strathroy.

Completion: September 1, 1957.

Project: 33 miles of 24-in. from **Kendal** to **Peebles, Sask.**

Status: Under way.

Contractor: **Fulton Banister, Ltd.,** John O'Rourke, superintendent, office at Wolseley, Sask.

Completion: July 31, 1957.

Project: 79 miles of 26-in. from **Clearbrook, Minn.,** to **Superior, Wis.**

Status: Under way.

Contractor: **R. B. Fulton & Co.**

Completion: August 31, 1957.

- **Pembina Pipe Line, Ltd.**

Project: 100 miles of 3 to 12-in. gathering line in **Pembina** oil field.

Contractor: **Universal Pipe Line, Ltd.,** subsidiary of Mannix, Ltd., T. Childress, spread superintendent, office at Drayton Valley, Alta.

Completion: November 1, 1957.

Project: 32 miles of 16-in. from Calmar to Edmonton, Alta.

Status: Under way.

Contractor: **Universal Pipe Lines, Ltd.,** subsidiary of Mannix, Ltd., Otis Hare, spread superintendent, office at Calgary, Alta.

Completion: July 1, 1957.

- **Royalite Oil Co., Ltd.**

Project: 250 miles of line to move oil from the Athabasca oil sands of northeastern Alberta to Edmonton.

Status: Long range plans.

Completion: 1960.

- **Trans Mountain Oil Pipe Line Co.**

Project: 100 miles of 30-in. loops: 50 miles east of Kamloops, B. C., and 50 miles west of Edson, Alta.

Status: Under way.

Contractor: **Marine Pipeline & Dredging, Ltd.,** has Thompson River crossing, B. C., J. H. McCartney, spread superintendent, office at Kamloops, B. C. **R. A. Conyes Construction Co.** has the 50 miles east of Kamloops; **Dutton-Williams Brothers, Ltd.** has the other 50 miles.

Completion: River crossing completed; remainder to be completed by July 31, 1957.

- **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the **Carnduff-Glen Ewen** area to tap **Cantal, Hastings, Florence, Carnduff,** and **Glen-Ewen fields;** 34 miles of 4, 6, 8-in. gathering lines.

Status: Has requested permit from Board of Transport Commissioners.

Contractor: **Majestic Contractors, Ltd.,** Jeff Minter, spread superintendent, office at Estevan, Sask.

Completion: No date set.

Project: 75 miles of 16-in. from Steelman, Sask., to Cramer, Man., Canada.

Status: Under way.

Contractor: **Gragg (Canada), Ltd.**

Completion: July 30, 1957.

Canadian Products Pipelines

- **Hydrocarbons Pipeline Co.** (Subsidiary of Canadian Hydrocarbons).

Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to **Fort William, Ont.**

Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start in 1957.

Construction consultants: **Dutton-Williams Brothers, Ltd.,** Calgary, and **A. D. Little & Co.,** Boston.

Canadian Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Contractor: **Dutton-Williams Brothers, Ltd.,** has preliminary studies, design and management-engineering. **Universal Pipe Line, Ltd.,** subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.,** has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.,** has 17 miles of 34-in. west from Trans-Canada pipeline origin near Burstall, Sask., to near Cavendish, Alta.; and 100 miles of 18-in. north to Bindloss and Provost fields, John O'Rourke and George Caron, superintendents, office at Empress, Alta., to complete summer 1957.

Status: River crossing completed. Total project to be completed in 1960.

- **Inland Natural Gas Co., Ltd.**

Project: 304 miles of mainline and 25 miles of laterals from Savona to **Nelson, B. C.:** 150 miles of 12-in.; 112 miles of 10-in.; 67 miles of 6-in. Also will build 400 miles of distribution piping in 31 towns.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.;** Pat Campbell, project manager, office at **Penticton.**

Completion: October 1, 1957.

- **Northern Ontario Pipe Line Crown Corp.** (formed by the federal and Ontario governments).

Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line. Upon completion this section will be leased to Trans-Canada Pipe Line Co. with option to buy.)

Status: Part of preliminary work under way. Pipe laying on 79-mile section from

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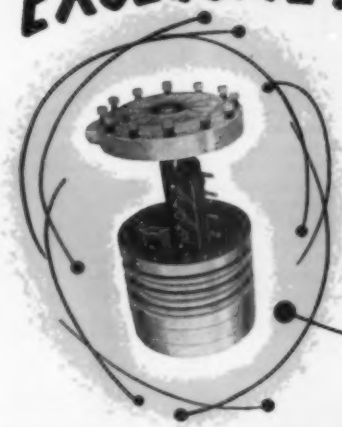

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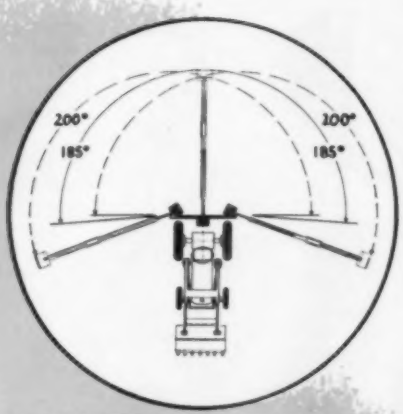

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Pipeline Patrol

Stedman to Forham Township to start July 1, 1957.

Contractor: **Dutton Williams Brothers** has 58 miles from the Manitoba-Ontario border west of Kenora to a point east of the crossing of Ontario Highway 17. **Morrison Shivers, Ltd.** has 94 miles from the east crossing of Highway 17 to a line separating the townships of Hyndman and Hodgson. **Majestic Contractors & Associates** has 80 miles from the Morrison Shivers terminal to Stedman Township. **Houston Contracting Co.** has 79 miles from Stedman to Forham Township. R. L. Silar, spread superintendent, office at Port Arthur, Ont. Remainder not let.

Completion: End 1957.

• **Plains-Western Gas & Electric.**

Project: 25 miles of 10-in. from the Trans-Canada Pipe Line to Brandon, Manitoba.

Status: Under way.

Contractor: **Banister Construction, Ltd.**, Ole Johnson, superintendent.

Completion: September 1, 1957.

• **Saskatchewan Power Corp.**

Project: 13 miles of 4-in. lateral to town of Kerrobert, and 10 miles of 6-in. lateral to Kindersley Power Plant, Sask.

Status: Planned.

Contractor: **Banister Construction, Ltd.**

Completion: July 15, 1957.

Project: 300 miles of 1 to 20-in. distribution lines at Regina, Sask.

Status: Planned.

Contractor: **S. E. Construction (Alberta) Ltd.**, and **Pacific Pipeline Construction (Alberta), Ltd.**, jointly.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal. One 675-mile section is being built by Northern Ontario Pipeline Crown Corp.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leaonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54 miles from Portage la Prairie to Winnipeg); **Universal Pipe Line, Ltd.**, subsidiary of **Mannix, Ltd.**, (90 miles from Moose Jaw to Welseley, spread superintendent, Otis Hare, office at Regina, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, under way, to complete August 1957). **Price-Poole of Canada, Ltd.**, has 100 miles from Miniota to near McGregor.

Completion: September 1957.

Project: 82 miles of 30-in. from near Winnipeg to the Ontario-Manitoba border.

Status: Under way.

Contractor: **Majestic Contractors, Ltd.**, K. B. Killingsworth, spread superintendent, office at Ste. Anne, Man.

Completion: October 15, 1957.

• **Union Gas Co. of Canada, Ltd.**

Project: 142 miles of 26-in. from Dawn Township to Hamilton, Ontario, plus 55 miles of 6 to 20-in. laterals, and 317 miles of 2 to 12-in. distribution lines.

Status: Planned.

Completion: November 30, 1957.

Project: 17 miles of 8 to 20-in. storage lines in Dawn Township, Ontario.

Status: Planned.

Completion: August 1957.

• **Westcoast Transmission Co., Ltd.**

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way.

Contractors: **Dutton-Williams Brothers, Ltd.**, has 120 miles from Taylor, B. C., to Azouzetta Lake, completed; **Universal Pipe Lines, Ltd.**, subsidiary of **Mannix, Ltd.**, has 110 miles between Huntingdon and Kingsvalle, B. C., F. L. Byers, spread superintendent, office at Hops, B. C.; **Canadian Bechtel, Ltd.**, has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.**, has 210 miles; **River Construction Corp., Ltd.**, has under way 142 miles of 12, 18, 20, 26-in. gathering lines in northern Alberta and British Columbia, E. L. (Tex) Maggard, superintendent, office at Dawson Creek, B.C. **Marine Pipeline & Dredging, Ltd.**, has Fraser and Peace River crossings, Waldo Trim, spread superintendent, offices at Fort Saint John and Hope, B. C.

Completion: Dutton-Williams section completed. R. A. Conyes section and Canadian Bechtel section to be completed September 1957. Marine Pipeline work to be completed June 30, 1957. Universal Pipe Lines, Ltd. and River Construction Corp., Ltd. will complete work September 1, 1957.

Project: 174 miles of 30-in. from Savanna Creek area to the Canadian-Idaho border.

Status: Proposed.

Foreign Crude-Oil Pipelines

• **Aramco-I.P.C.-Iranian Consortium.**

Project: 1,500 miles of 38 or 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.

Status: Proposed.

• **Bolivian Gulf Oil Corp.**

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

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⅛" to 4"—Seamless
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New York, N. Y.—Max Rothenberg, 11-05 38th Ave., Long Island City
Omaha, Nebraska—Wm. Freiden, Central States Engineering & Sales Co., 5101 Blondo St.
Oswego, N. Y.—Northeastern Associates, Inc., Neil Chatterton, Sec'y., P. O. Box 284
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
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Pipeline Patrol

Status: Awaiting pipe.
Contractor: **Williams Brothers Co.**
Completion: December 1957.

- **Caltex**

Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles of Minas field later.
Status: Planned.
Completion: Duri-Dumai line to be finished in 1959; extension to Minas later.

- **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.
Status: Under way.

- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**

Project: Two 10-in. lines from Hassi Messaoud and Edjele, Algeria to the railhead at Touggourt.
Status: Planned.
Completion: 1958.

- **Creole Petroleum Corp.**

Project: 87 miles of 30-in. from Temblador field to Caripito in Venezuela.
Status: Planned.
Completion: 1959.
Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.
Status: Planned.
Completion: Late 1957.

- **Deutsche-Shell A.G.**

Project: 120 miles of 20, 24-in. from Marseilles, France, to Rotterdam, Germany, to tap the proposed 700 mile trans-Europe line being considered by the Royal Dutch-Shell Group.
Status: Planned.
Completion: 1960.

- **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.
Status: Proposed. Survey completed.

- **Mene Grande Oil Co.**

Project: 97 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco.
Completion: First quarter 1958.

- **National Iranian Oil Co.**

Project: A 1,000-mile line to move Qum crude to the Mediterranean.
Status: Under study.

- **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
Status: Planned.
Completion: 1959.

- **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

- **Sinclair Oil Corp. and Socony Mobil Oil Co.**

Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.
Status: Under way.
Contractor: **Williams Brothers Sudamericano, Ltd.**
Completion: July 1957.

- **Standard-Vacuum Petroleum Maatschappij.**

Project: 94 miles of 8-in. from Lirik field, Central Sumatra, to deep-water terminal on Siak River, near Buatan. A 3-in. hot-water "defroster" line will be laid under the 8-in. to heat the heavy crude.
Status: Under way.
Completion: Late 1957.

- **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**

Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
Status: Under study.
Status: Under way.

- **Yacimientos Petroliferos Fiscales** (Argentina)

Project: 932 miles of 12-in. from Campo

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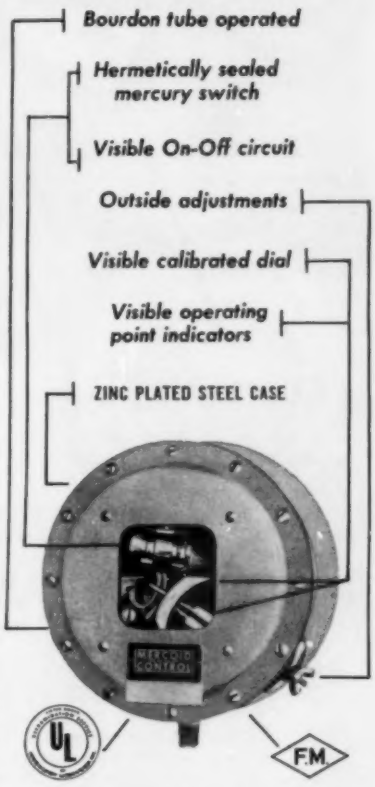

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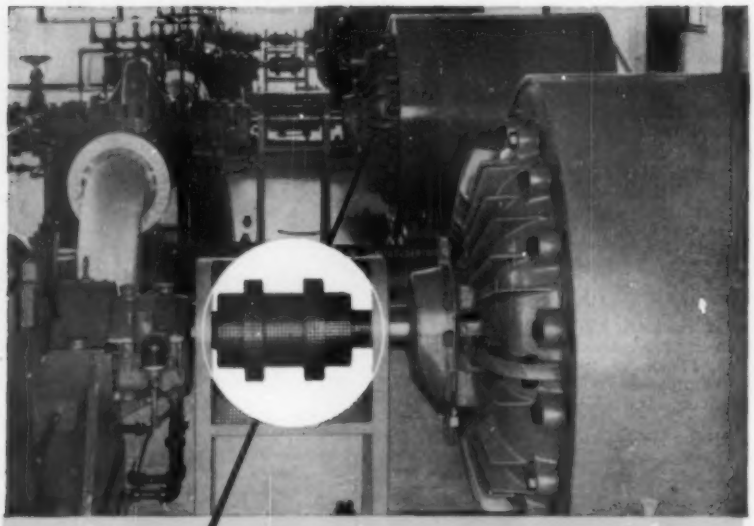
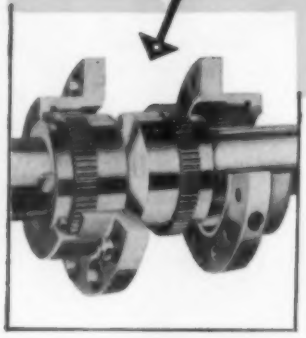


Waldron couplings in main line crude oil station

WALDRON

flexible couplings...



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same 3 reasons

1 STRENGTH — Hubs and cover sleeves for sizes 1¼ A through 7A are machined from tough steel forgings. Hubs are keyed to the shafts. The two one-piece cover sleeves function as a single, rigid unit serving as a floating connecting link between the hubs. High strength of forgings makes possible a very compact coupling with low rotating inertia.

2 RELIABILITY — There are no flexible parts to bend or break and the coupling is dust, moisture, and oil tight. Patented Walflex seal is positioned where centrifugal force is least. Clearance between teeth in hubs and sleeve is engineered so that an oil wedge always separates them, taking the wear.

3 SERVICE — Plenty of rough bore couplings, already assembled—on the shelf for *immediate* delivery. Finish bored standard couplings shipped to meet customers' schedules. We are geared up to give you realistic delivery on *any* type of couplings.

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NEW BRUNSWICK, NEW JERSEY

Representatives In Principal Cities

Export Agents—Frazar & Co., New York, N. Y.

Pipeline Patrol

Duran to San Lorenzo.

Status: Under way.

Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Foreign Products Pipelines

• **Empresa Nacional de Petroleos** (Government of Chile) and **Cia. de Petroleos de Chile (Copec), et al.**

Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.

Status: Planned.

Contractor: **Williams Brothers** has design and engineering contract.

Completion: Design plans will be completed August 1, 1957. No date for construction has been set.

• **Yacimientos Petroliferos Fiscales** (Argentina).

Project: 497 miles from Mendoza to Buenos Aires.

Status: Proposed.

Foreign Natural-Gas Pipelines

• **Andes Pipeline Corp.** (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.

Status: Proposed.

Contractor: Will do own work.

• **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

• **Cia. Shell de Venezuela.**

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Under way.

Contractor: **Williams Brothers Co.**

Completion: 1957.

• **Gaz de France**

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Right-of-way work under way.

Contractor: Being handled by French contractors.

Completion: First stage in 1958; complete system in 1960.

• **Petroleos Mexicanos**

Project: 130 miles of 22-in. to parallel 14-in. line from Reynosa to Monterrey in northern Mexico.

• **Sui Gas Transmission Co.**

Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

Contractors: **Pakistan Constructors**, a joint company of **Morrison-Knudsen** of Boise Idaho, and **William Press, Ltd.**, of London.

Project: 145-mile line from Sylhet to Dacca, East Pakistan.

Status: Under consideration. If approved construction could start December 1958.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**

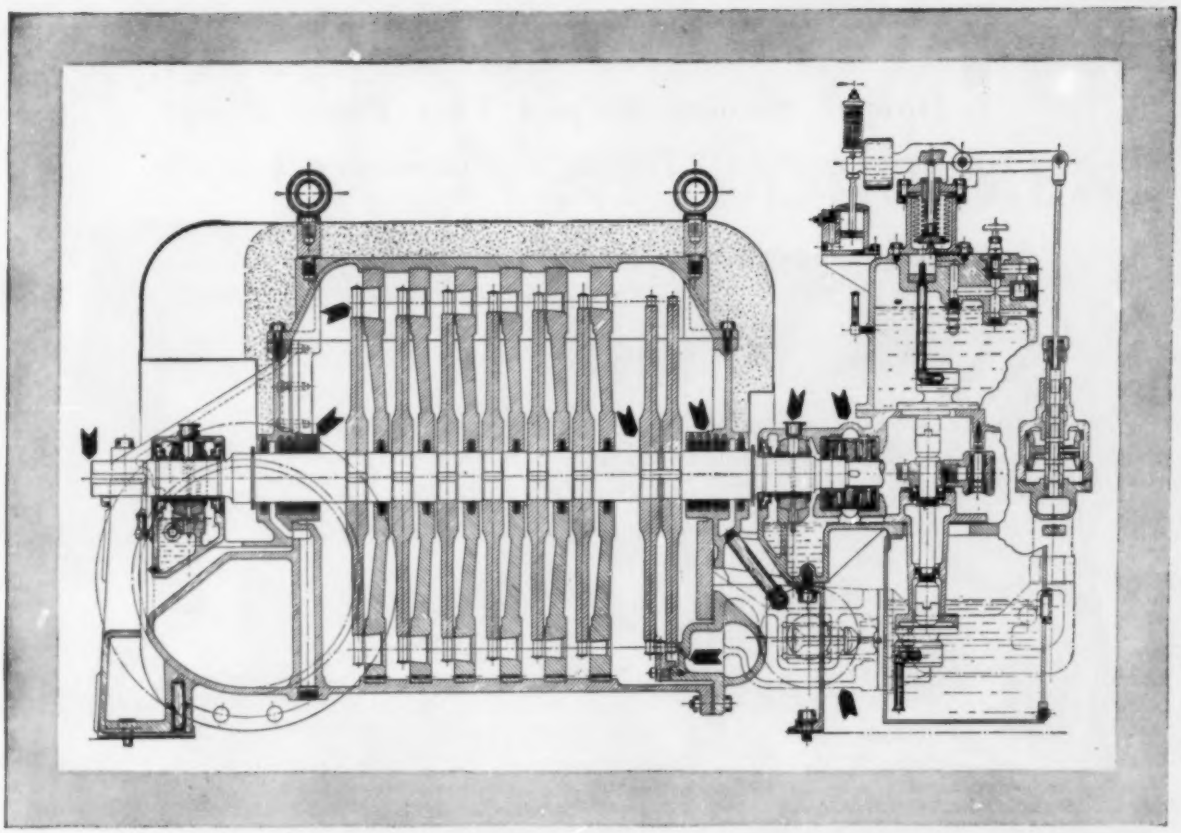
Project: 207 miles of 26-in. from Anaco fields to Caracas.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.

Completion: Spring 1959.

Status: Under way.



ANOTHER INSIDE STORY OF THE UNIVERSAL ACCEPTANCE OF MURRAY MULTI-STAGE TURBINES IN THE MECHANICAL DRIVE FIELD

- Husky accurately machined shaft.
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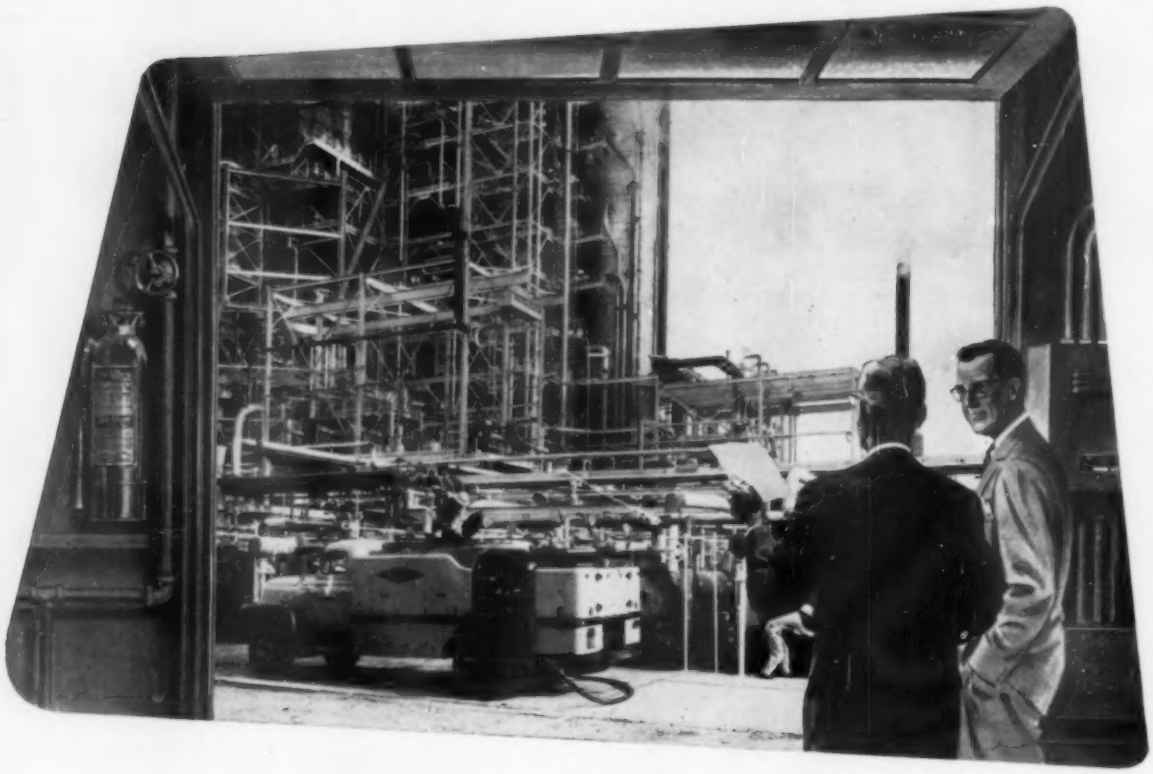
Our nearest representative will gladly help you solve your mechanical drive turbine requirements. Just write to Murray Iron Works Company, Burlington, Iowa, for his name.

★ ★ **Murray Turbines** ★ ★

Dowell Service Helped This Plant Profit By Saving $312,700 in Maintenance Costs!



To clean and service the giant catalytic crackers in today's modern refineries is quite a job . . . and very costly. Costly, that is, unless Dowell Service is on the job to help clean the "cats"—chemically. Here's an example of how Dowell chemical cleaning service cut turnaround costs for one refiner by $312,700.

Dowell was called in to provide cat cracker turnaround service which included the cleaning of: two flue gas coolers, two catalyst coolers, four overhead aftercoolers, one light gas oil cooler, one heavy gas oil cooler, two top tray reflux coolers, and two final gas condensers.

Dowell's time: thirteen and one-half hours; Cost: $2300.

It is estimated that this same cat cracker service, if done by mechanical methods, would have cost the refinery: 1) Additional downtime of seven days—$210,000; 2) Additional spare bundle inventory—$100,000; 3) Labor—$5,000.

The refinery enjoyed a $312,700 operating credit from this single cat cracker turnaround—not including expected efficiency increases.

Dowell provides expert service in removing scale and sludge from product, process and steam generating systems. Dowell does the job for you—furnishing all chemical solvents, trained personnel, pumping and control equipment. Furthermore, Dowell has the experience in chemical cleaning to provide assurance of a job well done.

While the example here deals with an oil refinery, Dowell chemical cleaning has recorded similar profit-making savings for other industries. Dowell engineers can show you performance data in almost any field — steel, chemical, power, paper, construction.

For specific information on how Dowell chemical cleaning can help your plant to greater profits, call the Dowell office nearest you. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

have Dowell clean it chemically

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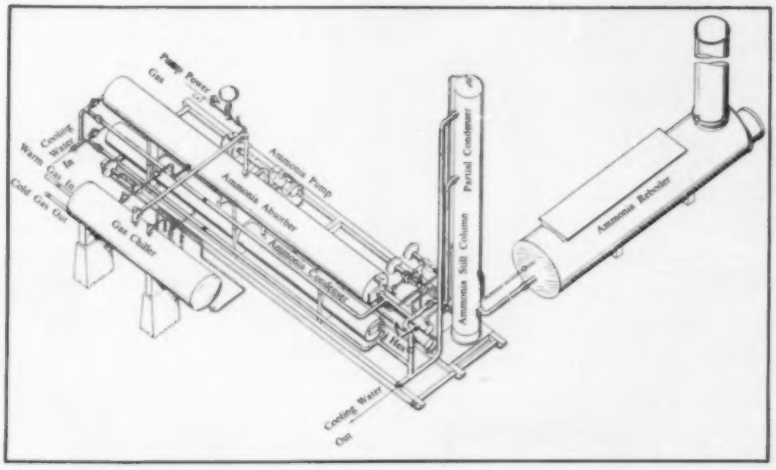
SHOWCASE...

NEW EQUIPMENT



Refrigeration Unit Runs Automatically

Temperatures below ordinary atmospheric level, for gas processing may be obtained with this new BS&B ammonia-absorption refrigeration unit. It can be used: (1) for hydrocarbon dewpoint control in pipelines, (2) to increase hydrocarbon recovery with low-temperature separation units where there is no available pressure expansion, and (3) to increase gasoline-plant hydrocarbon recovery by chilling the absorption oil.

The refrigeration unit operates completely automatic and unattended under widely fluctuating loads. Its required power input is proportional to load.

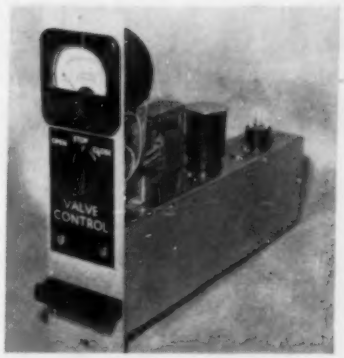
The standard unit is readily skid-mounted (except for the ammonia reboiler which is on a single skid). It is made in 11 available sizes with capacities ranging from 8 to 200 tons at —10° F. chiller temperature. Larger units are available upon special request. **Write or call: Black, Sivalls & Bryson, Inc., Product Information Dept., 7500 East Twelfth Street, Kansas City 26, Mo., for details on ammonia-absorption refrigeration unit.**

●

Diamond Coring Bit Comes in Three Types

Trade named Drillco, this new surface-set diamond coring bit is made in all qualities of West African diamonds and furnished in D.C.D.M.A. standard sizes from EXT to 7¾-in. diameter.

The diamonds are set in a choice of three types of powdered-metal matrices: (1) standard matrix for nonabrasive, relatively solid, good coring formations, (2) hard matrix for somewhat abrasive or fair coring formation, and (3) superhard matrix for extremely abrasive or badly broken and difficult coring formation. **Write or call: Diamond Products, Inc., 382 Prospect Street, Elyria, Ohio, for details on Drillco coring bits.**



Indicator/Controller Remotely Operates Valves

Operation and position indication of remotely located valves, gates, feeders, or other devices is possible with this new Synchro-Scan position indicator/controller unit. The unit permits remote modulation and continuous indication of valves or similar devices. This is done through the plug-in transmitter package.

A three-position (open, close, and off) switch mounted on the transmitter face controls the unit. Above this switch, a small voltmeter type of indicator, graduated from 0 to 100 per cent, indicates the per cent of opening.

At the receiving end, another pack-

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of June 24, 1957

NAME.....TITLE.....

COMPANY.....

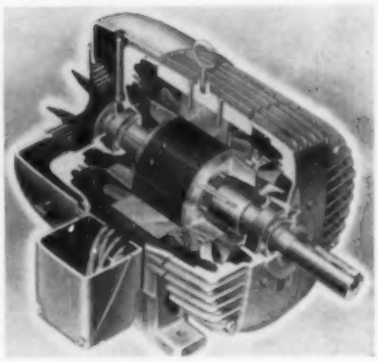
ADDRESS.....

CITY.....STATE.....

DATE.....

New Equipment

aged unit contains the control relays and regulated d.c. voltage supply that transmits the position indication. An electric position transmitter originates the voltage. Only two wires and a ground are required to transmit the signal. **Write or call: Builders-Providence, Inc., 345 Harris Avenue, Providence, R. I., for details on Synchro-Scan controller.**



Induction Motors Feature New Design

This new G-E totally enclosed fan-cooled motor is one of a new line of induction motors made in sizes from 40 to 125 hp. The motor line is built to new N.E.M.A. standards which assign a greater horsepower to a given motor-frame size. This rerating program results from advances in metallurgy, insulating materials, and new production techniques.

According to the manufacturer, the weight reduction, compared with the former line, averages 20 per cent. In general, the new models range from 100 to 500 lb. lighter in comparable ratings. Lineal dimensions have been reduced an average of 10 per cent and volume an average of 27 per cent.

The totally enclosed fan-cooled model shown has been designed for maximum protection when used in chemical and other corrosive atmospheres. Gaskets are used between the conduit box and frame and between the two diagonally split sections of the conduit box. The fan drives air over the motor at high velocity and pressure. Heavy ribs have been provided for greater surface cooling. **Write or call: General Electric Co., Schenectady 5, N. Y., for details on rerated a.c. induction motors.**

●

Drilling Hook Carries 500-Ton Rating

This Model 5500 drilling hook is said to be the largest capacity hook ever manufactured for the petroleum industry. Rated at 500 tons, it was developed expressly to hold the long strings of pipe and casing needed for deep-drilling operations, both offshore and onshore.

Its features include a patented BJ hook positioner which can be preset to automatically turn the elevator-door handles so they face the derrick man when the elevator reaches the monkey board.

It also incorporates a hydraulic snubber to prevent drill-pipe bounce and battered joints. Also, a flexible pin connection between the hook body and the shank provides swivel action to

Yes—thread failure on drill collars and tool joints *can* mean troublesome, costly fishing jobs—and sometimes complete loss of expensive drilling strings.

A break-out of galled and frozen joints costs money through shut down—damaged threads mean replacement of drill collars and pipe.

So—it pays to use the best.

Lubrication Engineers, Inc. are specialists in the field of quality lubrication and have developed two outstanding products that are saving dollars every day in the drilling industry.

LE #195 Drill Collar Compound is a scientific combination of metallic materials—built to withstand the high torque—pressure—and temperature of deep drilling. Forms tight leakproof seals—yet permits easy disassembly of mechanical joints.

LE #900 Tool Joint Compound is a non-hardening —easy to apply—metallic base product. Resists moisture—gives maximum assurance against galling and freezing—lengthens thread life.

AVAILABLE THROUGH MOST LOCAL SUPPLY STORES, OR WRITE, WIRE OR CALL FORT WORTH OFFICE DIRECT

LUBRICATION ENGINEERS, INC.

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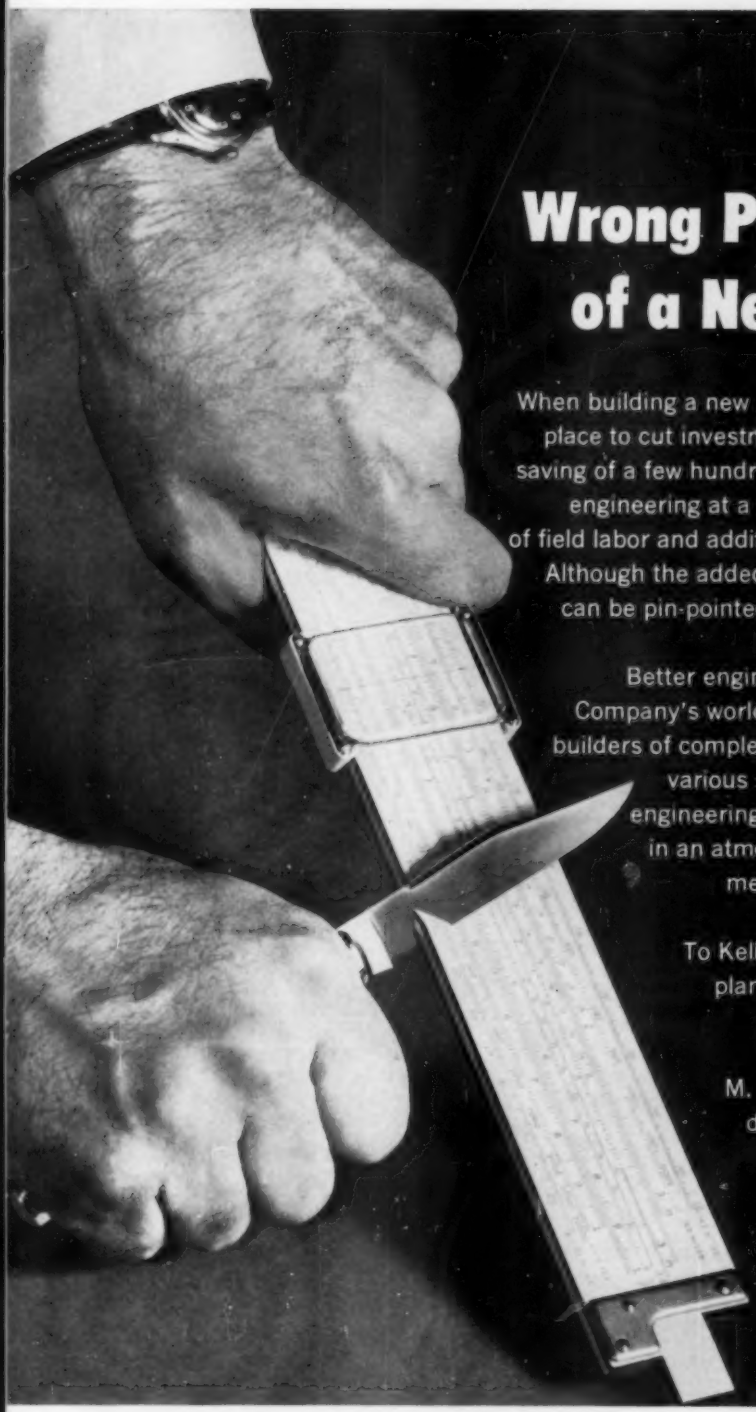
INDUSTRIAL LUBRICANTS AND OIL FIELD SPECIALTIES



Wrong Place to Cut Costs of a New Process Plant

When building a new process plant, engineering is the easiest place to cut investment costs. But it's the wrong place! The saving of a few hundred hours of engineering, or trying to buy engineering at a price, can cost thousands of extra hours of field labor and additional thousands of dollars for materials. Although the added cost of inadequate engineering seldom can be pin-pointed beforehand, it is inevitably reflected in the operating record of the plant.

Better engineering is the basis of The M. W. Kellogg Company's world-wide reputation both as engineers and builders of complete process plants and as consultants on various special engineering projects. This better engineering is the result of good engineers working in an atmosphere where sound engineering is the measure of success for both the individual and the organization.

To Kellogg's clients, better engineering means plants built at the lowest capital investment consistent with reasonable operating and maintenance costs.

M. W. Kellogg welcomes the opportunity to demonstrate how better engineering can benefit companies contemplating new process plants.

REFINERY PROCESS DIVISION

THE M. W. KELLOGG COMPANY

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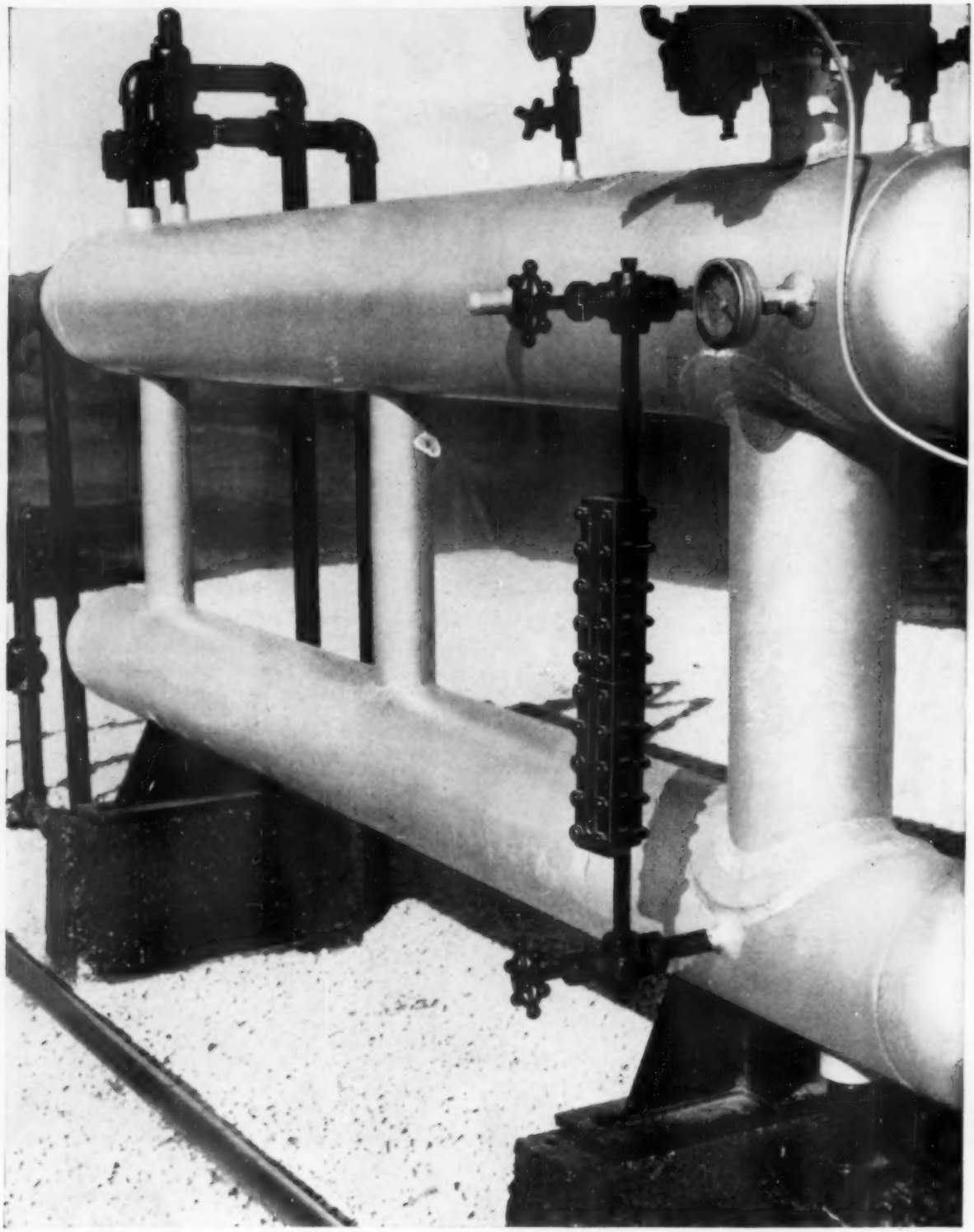

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Continental Oil Co., Short Junction Booster, Cleveland County, Okla.

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- EJECTORS
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New Equipment

automatically balance the hook and elevator load and prevent unequal loading on the ears of the elevator or under the pipe couplings and tool joints. **Write or call: Byron Jackson Tools, Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif., for details on 5500 hook.**

•

Lapping Machine Speeds Maintenance Work

Measuring 15 by 14½ in., this Lap-King bench type of portable lapping machine is capable of producing lapped surfaces accurate to 11.6 millionth of an inch, according to the maker. Equipped with three lapping plates, lapping compound, and lubricant, the machine allows quality control to be easily maintained because it is specially designed to relap its own plates, one against the other, after a normal job run. This assures consistent optically flat lapping plates for automatic accuracy of lapped work.

An hour meter records the exact amount of lapping time on each plate. An automatic timer, operating on a 1-hour cycle, allows job-time control.

Powered by a ¼-hp. motor operating on 110-volt, a.c./d.c. power, the machine weighs 165 lb. **Write or call: Byron Jackson Pumps, Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif., for details on Lap-King.**

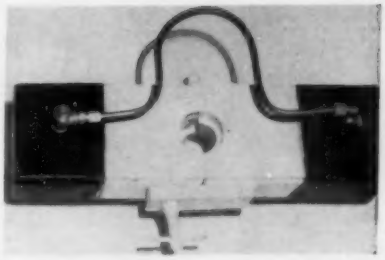
•

Heated Centrifuge Provides 100-Ml. Tests

This new Walker heated centrifuge, Model 100 Ml., is a combination preheater and heated-centrifuge machine designed for accurate testing of crude oil in 100-ml. A.S.T.M. pear-shaped test tubes. It uses hot water from the gager's vehicle to heat the preheaters and the main body of the centrifuge.

The gager can heat the samples in the preheaters and then place them in the machine where they will remain hot during the grindout period, thus insuring an accurate test for b. s. and w., regardless of weather conditions, according to the maker.

It has been well proved over the past 2 years by the results from it and from the company's original Walker Heated Centrifuge Model 12.5 Mark 1 built for the smaller 12.5-ml. A.P.I. test tube. **Write or call: W. L. Walker Co., 1009 South Main Street, Tulsa 19, Okla., for details on Model 100 centrifuge.**



New Device for Pumping Wells, Saves Packing

This new stuffing-box packing saver and fluid injector serves a dual purpose

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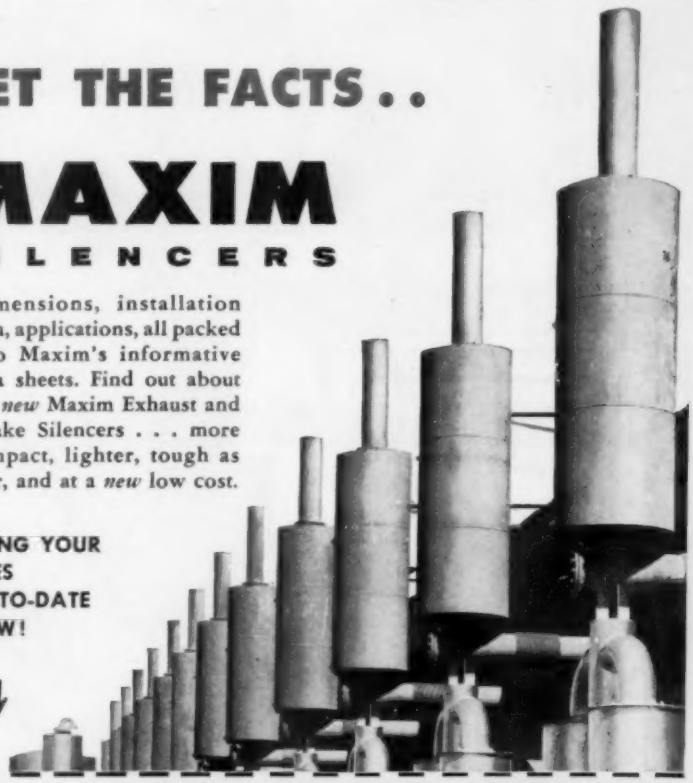

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Subsidiary of Emhart Manufacturing Company

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ADDRESS _____

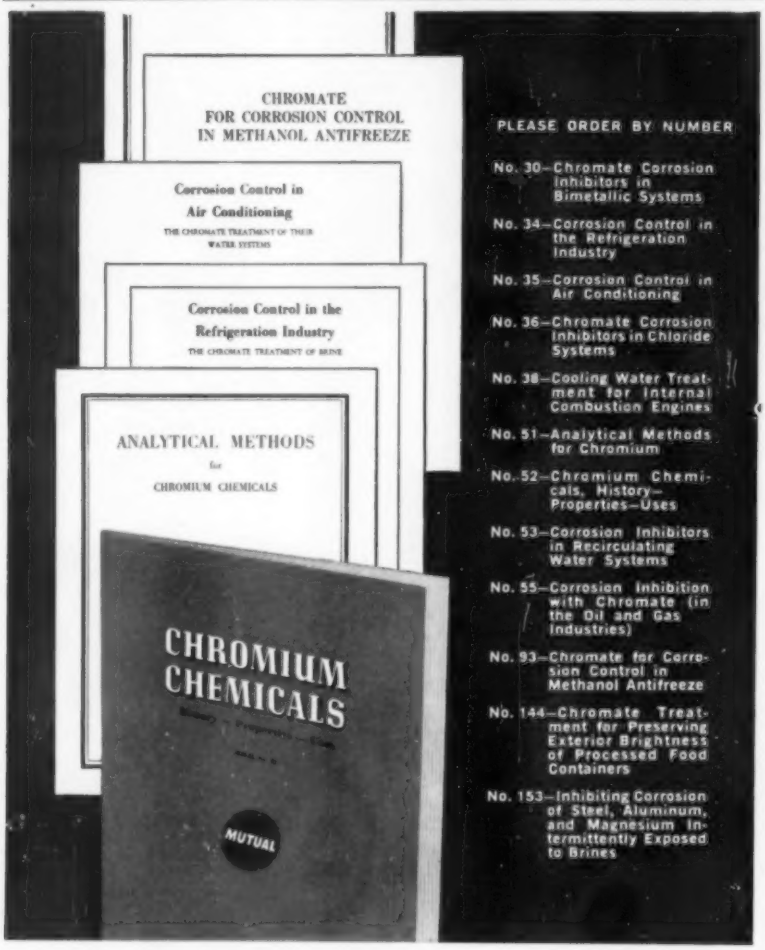
New Equipment

on pumping wells. First, it is so designed that its spring-loaded polish-rod brighteners rid the polish rod of corrosion deposits, preventing such deposits from building up and cutting out the packing in the stuffing box.

The polish-rod brighteners, made of bronze, are available in sizes to fit all popular polish-rod diameters. Reservoir compartments in the device can be used to store fluids that counteract corrosion buildup and its attack on the polish rod.

Second, the fluid-storage compartment in the device can be used for storing paraffin solvents. By tying in the connections from this compartment to the casing or tubing, the paraffin solvents can be injected into the desired point. Because there are two compartments, one can be used for one type of fluid and the other for another.

The new device is made to attach to most stuffing boxes. **Write or call: O. G. Pro. Technical Services, 651 San Jacinto Bldg., Houston, Tex., for details on stuffing-box packing saver.**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No. 93—Chromate for Corrosion Control in Methanol Antifreeze
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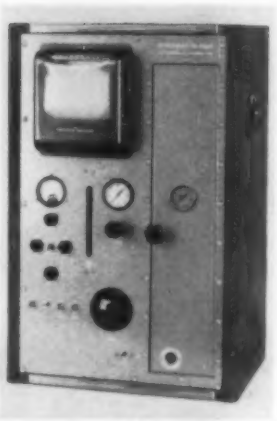


Gas Chromatograph Uses Building-Blade Accessories

High flexibility is offered by this new gas chromatograph designated the Chromat-O-Flex Model 1, the maker reports. The unit is offered as a basic instrument with optional accessory building blocks for specialized applications.

The instrument has built-in circuitry for either filament-element or ultrasensitive thermometer-element detectors. Its vertical oven has adequate space for either coiled or U-bend columns.

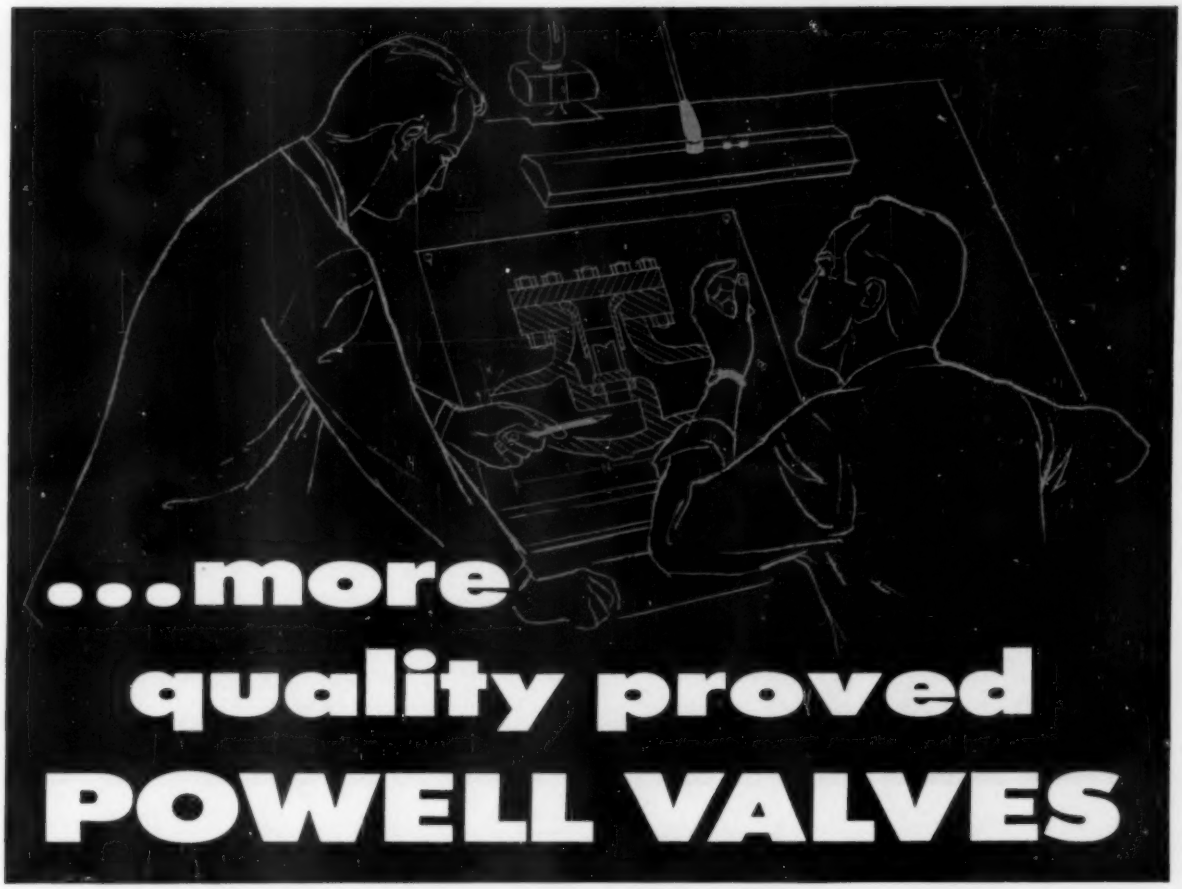
The temperature range is from ambient to 425° F. Small recorders can be mounted within the instrument. Full-size recorders can be obtained in matching cabinets. **Write or call: Loe Engineering Co., 4851 Del Monte Road, La Canada, Calif., for details on Model 1 Chromat-O-Flex.**

●

Differential Pressure Switch Uses Metal Diaphragm

In this Model 2273 differential switch for vacuum and low pressure, a metal diaphragm is used to obtain accurate response. Useful for operating relays, solenoids, motor controls, and similar devices, the switch comes in two classes for sensing pressure differences ranging from 15 in. of water below atmospheric pressure to 80 in. of water above.

(Continued on page 211)



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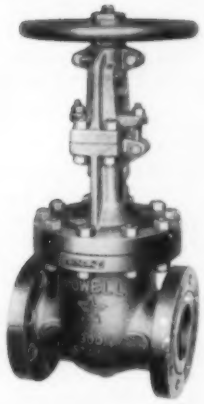


FIG. 3003—Steel Gate Valve for 300 Pounds W.S.P.

FIG. 1559—Steel Lubricated Plug Valve, ASA 150 Pounds, Screwed Gland Type, 1" to 4", inclusive.

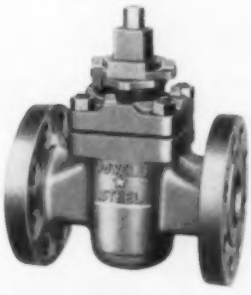
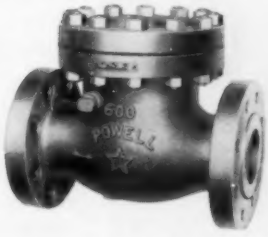
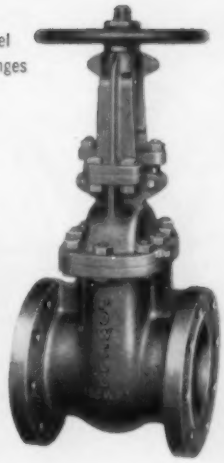


FIG. 2456 SG—Large Stainless Steel Gate Valve for 150 Pounds W.P. Flanges conform to latest Standards.

FIG. 6061—600-Pound Steel Swing Check Valve.





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Mechanized Cutting Speeds Scrapping of 95-Ton Pressure Vessels

Scrapping huge pressure vessels loomed as a costly, time-consuming job for a large scrapyard in Birmingham, Alabama. But mechanized oxygen-cutting quickly cut this job down to size—and with substantial savings in labor and materials.

The versatile OXWELD CM-45 Portable Cutting Machine teamed up with a C-56 Blowpipe to slice through 8-in. thick laminated steel walls at a speed of 4 to 5 in. per minute. Two 24-ft. cuts were made in each vessel in less than two hours' time. Transverse cuts were then made to reduce these sections to charging-box size.

Today scrapyards, fabricators, and maintenance shops everywhere are slashing costs with the speed and efficiency of mechanized oxygen-cutting.

See how you, too, can save. Ask your nearby LINDE representative to show you the *complete* line of dependable OXWELD Portable Cutting Machines—or write for free catalog F-4487. Do it today!

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SHOWCASE . . .

New Equipment

The fixed actuation value ranges from 0.2 to 2 in. of water, depending on the switch setting. The reference pressure must be air or an inert gas. The variable pressure may be liquid or gas.

The switch will actuate an electric circuit on an increase or decrease of a predetermined pressure difference. It can be adjusted readily with an external adjustment screw for field setting.

The switch is not sensitive to jarring or vibration. And it will operate in any position—no leveling or special mounting is necessary. A splashproof housing protects the entire mechanism from dust or damage in exposed installations. **Write or call: Barksdale Valves, Pressure Switch Div., 5125 Alcoa Avenue, Los Angeles 58, Calif., for details on Model 2273 switch.**

•

High-Low Shutoff Valve Has Manual Reset Controls

This McMurry Type HLM-NC high-low shutoff has been designed for positive closing on any predetermined high or low-pressure setting. Yet it can be reopened manually in a few seconds by picking up a small weight bar, the maker reports.

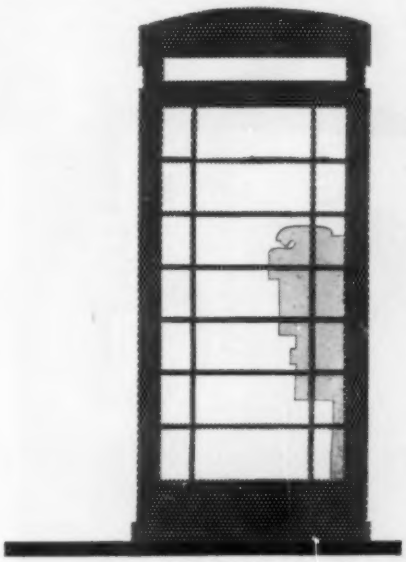
The complete pilot system is of no-bleed design so that the volume of pilot gas required for a complete function will be only a few cubic inches. If supply gas should fail, the motor valve closes automatically, under any condition.

This tool also can be obtained without the manual reset feature, if desired. The construction is identical, except that the Bourdon tubes will reset themselves automatically after trouble is corrected. **Write or call: McMurry Oil Tool Specialties, 1020 Houston Avenue, Houston, Tex., for details on Type HLM-NC high-low shutoff.**

•

Drum-Head Cutter Eliminates Saw-Tooth Edges

In plants where it is often practical to cut the heads out of used drums so they can be used for other purposes, this new Schinker hand-operated head cutter may be valuable. It will do the job of cutting the head out of a drum



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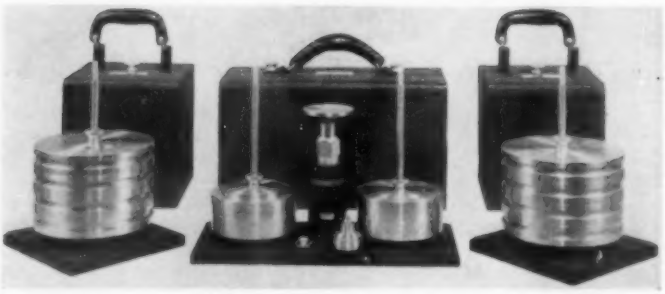
KH 189

New Equipment

in 2 minutes, the maker says.

The head cutter leaves a safe turned-in edge. The device employs a sealed gear case with worm-gear assembly. The adjusting track is cast in hard bronze. Serving also as the stabilizer bar, the adjusting bar is threaded into the main housing. Ample bearing capacity is provided for hard service and easy operation. **Write or call: Michael A. Schinker Mfg. Co., 6514 S. Western Avenue, Chicago 36, Ill., for details on drum-head cutter.**



Dead-Weight Gage Upped to 10,000 Psi.

The pressure range of this portable RS Model 9015 dead-weight pressure gage has been upped from 5,000 to 10,000 psi. to accommodate pressure tests of high-pressure offshore wells. Besides pressure tests of wells, the gage makes a practical means for checking line pressures, static pressures on orifice meters, and gas pressure on pipeline-leakage tests, the maker points out.

The piston, cylinder, and weights are individually calibrated to an accuracy 0.1 per cent of the indicated pressure.

Ruggedly constructed for field use, the gage and weights are housed in three cases for easy portability. The case housing the gage proper weighs 46 lb. Each of the two cases housing the weights weighs about 50 lb. Thus, the complete unit weighs only about 150 lb.

In use, the gage may be removed from the base and placed directly on the pressure connection, or it may be left on the base and connected by tubing or hose. A tripod socket in the base of the case allows the gage to be mounted on a tripod, available as an accessory.

For safety, the gage is equipped with a safety head to prevent the piston from being blown out by sudden application of pressure. **Write or call: Refinery Supply Co., 621 East Fourth Street, Tulsa 3, Okla., for details on Model 9015 dead-weight gage.**

You'll win more than this prize. You'll increase drilling efficiency and control your mud better. Mud-O-Graf records every variation in mud weight, saving time and costly errors in the addition of weighting materials. All heavy and light streaks in the circulating system and their duration are recorded. Mud-O-Graf shows how often the hole is filled up when coming out of the hole and shows the time of a complete circulation. If it's a question of mud, ask for Mud-O-Graf.

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Machinery Roller Moves 300-Ton Objects

An easy way to move heavy machinery or equipment is offered by the Express Roller, a ruggedly built versatile unit which works on the principle of caterpillar action.

The unit comprises two main components: (1) a series of moving rollers locked in an endless track, and (2) extending above and below a heavy steel frame. The frame, which contains serrated edges, grips and carries the work load being moved. **Write or call: Industrial East Co., P. O. Box 561, Clifton, N. J., for details on express roller.**

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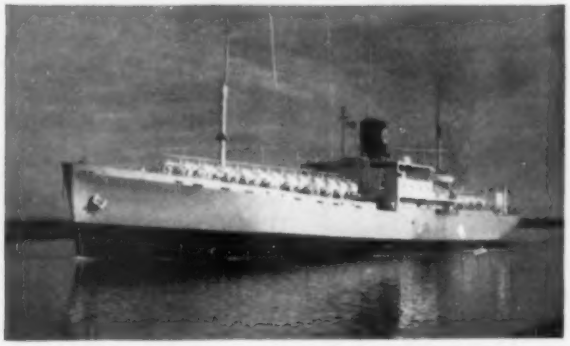

S.S. Ultragaz, converted to L.P. Gas Carrier. Water capacity 17,100 barrels.

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Esso Viru, oceangoing L.P. Gas Barge. Water capacity 220,000 gallons.

Panama City, rivergoing L.P. Gas Barge. Water capacity 393,000 gallons.

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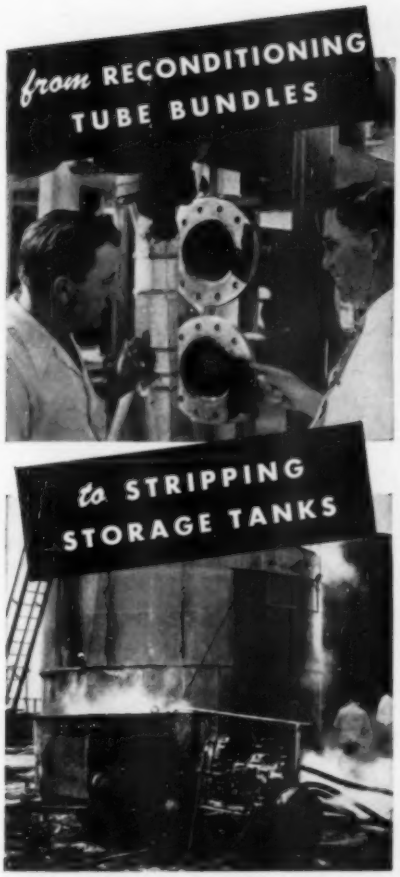

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These are just two of a whole range of maintenance cleaning jobs that can be simplified through the Oakite man's experience and the many materials, methods and equipment he can put to work for you. Bulletin F-7629 tells more. Write Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

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SHOWCASE . . .

New Literature

Engineer Data Book 10 (112 pages), a valuable aid for the selection and design of poly-V-belt drives, contains many useful charts, tables, and diagrams along with complete specifications for all drive sizes. The selection of the proper poly-V-belts and sheaves for drive of any speed of horsepower rating is made possible, without calculation, by means of easy-to-use standard drive tables. The book provides coverage of both theory and the practical application of a new V-drive, along with numerous illustrated case histories. In addition, the book furnishes comprehensive data on V-belt drives covering drive tables, horsepower ratings, installation instructions, and trouble shooting. **Write or call: Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J., for Engineering Data Book 10.**

•

Use of Prestressed Concrete in the Petroleum Industry. This new four-page bulletin describes the design and application advantages of prestressed concrete for the construction of storage tankage, fire walls, butane or propane-storage vessels, containment vessels, and shell foundations. **Write or call: Preload Co., Inc., 211 East Thirty-Seventh Street, New York, for bulletin on the use of prestressed concrete in the petroleum industry.**

•

Meters for Processing Plants. Twenty-eight page Bulletin 566 gives general specifications and describes and illustrates the accessories for Neptune industrial liquid meters. The bulletin has been completely revised to help the process engineer select the best meter-register combination for any industrial liquid-metering job that can be handled with the maker's standard line of meters. Arranged in comparative chart form, the subjects covered include: (1) how meters are made; (2) a list of liquids that can be handled; (3) construction details; (4) register types; and (5) available meter sizes. The bulletin also includes installation directions. **Write or call: Neptune Meter Co., 19 West Fiftieth Street, New York 20, for Bulletin 566.**

•

Controlled-Volume Barrel Pump with standard capacities from 500 ml. to 4 gal. per hour is described and pictured in two-page Bulletin 1256. It describes the advantages of the pump in combined pumping and metering of

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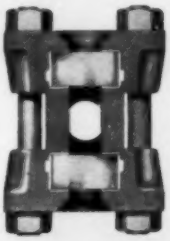

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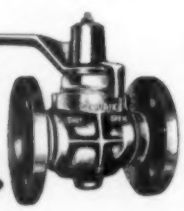

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toxic or corrosive chemicals from barrels or drums. The bulletin includes complete specifications and dimensions for handy reference. **Write or call: Milton Roy Co., 1300 Mermaid Lane, Philadelphia 18, for Bulletin 1256.**

•

Temperature-Monitoring Systems. Comprising eight pages, Bulletin 72 describes in detail standard subassemblies and their arrangement to form a completely integrated temperature-monitoring system for capacities up to several hundred points. Photographs and cutaway views illustrate individual components. A diagram shows how they are adapted to meet individual needs. The bulletin provides information on: (1) operational details, (2) specifications, (3) applications, (4) optional equipment, (5) temperature ranges for thermocouples and resistance bulbs, and (5) the various types of signalling devices used. **Write or call: Thermo Electric Co., Inc., Saddle Brook, N. J., for Bulletin 72.**

•

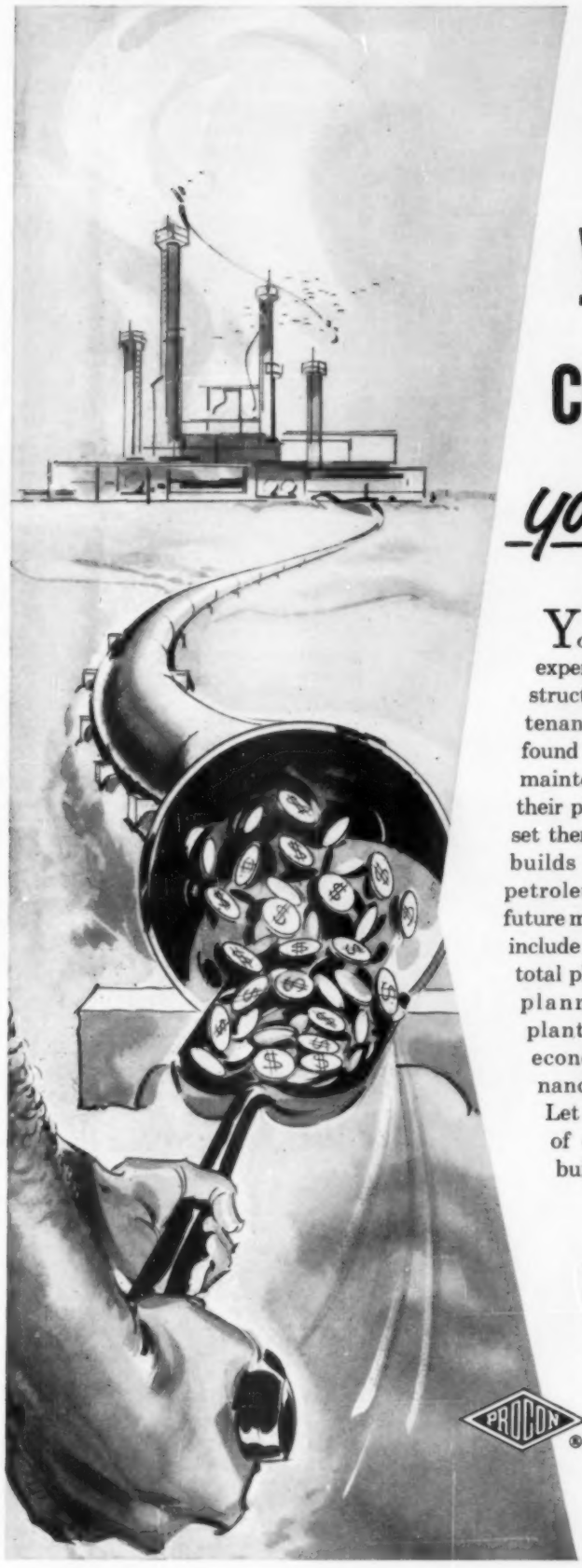
Protective Pipe Coatings. This folder features useful information on coal-tar coatings made in tape form for protecting from corrosion pipe, pipe joints, fittings, couplings, tanks, cable, conduit, and tie rods in underground service. **Write or call: Tapecoat Co., 1559 Lyons Street, Evanston, Ill., for folder on protective coatings.**

•

Engineering Instruments. This 72-page, two-color revised catalog presents tables, diagrams, and descriptions of transits, levels, leveling and stadia rods, compasses, field supplies, and numerous other instruments for engineering and surveying. Tables make it possible to locate detailed information at a glance. One chart, for example, gives in consolidated form the comparative dimensions of various models of Gurley transits. Many cross-sectional photographs and drawings show the parts of instruments to aid in their proper use and to facilitate parts orders. **Write or call: W. & L. E. Gurley, Troy, N. Y., for Catalog 50.**

•

"So You're Going to Buy an Industrial Battery" is the title of new 16-page illustrated reference Booklet GB-1788. The booklet is designed to help industrial-battery users select the most suitable battery for their operation. A four-point program describes: (1) the importance of selecting the proper battery for the job, (2) the purpose of correct charging and handling, (3) reasons for systematic maintenance,



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ANSUL

The Ansul Chemical Co., Marinette, Wisconsin

and (4) the value of a continuing knowledge of battery condition. Three brief case histories demonstrate the value of correct application engineering in handling battery problems. **Write or call: Gould-National Batteries, Inc., Trenton, N. J., for Booklet GB-1788.**

●

Tone Squelch Device designed to reduce interference problems in two-way radio systems is described and illustrated in new Bulletin ECR-449. The bulletin describes how unwanted signals and transmissions may be avoided if the device is installed in new radio systems or those already in use in the field. **Write or call: General Electric Co., Communication Products Dept., Electronics Park, Syracuse, N. Y., for Bulletin ECR-449.**

●

Diaphragm Control Valves in sizes from ½ through 14 in. are the subject of 12-page 2-color Catalog 104. The new catalog describes the valves' features for positive closure and new plastic valves and diaphragms for corrosive services. It includes a quick-reference chart for diaphragm-material selection and charts showing dimensional specifications for several valve models. **Write or call: Hills-McCanna Co., 2442 W. Nelson Street, Chicago 18, Ill., for Catalog 104.**

●

Diethylene and Triethylene Glycol are discussed in new 16-page Data Folder F-8085. It presents data on physical and physiological properties, specifications, shipping containers, constant-boiling mixtures, and applications. The data folder contains 15 easy-to-read charts showing physical properties of interest to users of diethylene and triethylene glycols. **Write or call: Carbide & Carbon Chemicals Co., 30 East Forty-second Street, New York 17, N. Y., for Data Folder F-8085.**

●

Mechanical Packings, braided, molded, and machined styles for handling acids, alkalies, solvents, and corrosives are described and pictured in new eight-page Bulletin P-325. The packings covered in the brochure include 15 types with braided construction and six types with molded construction. The brochure gives specific recommendations as to services, applications, and temperatures. It also provides information on pressures, dimensions, and mechanical requirements. **Write or call: Crane Packing Co., 6400 Oakton Street, Morton Grove, Ill., for Bulletin P-325.**

WILLIAMS

TOOLS OF INDUSTRY

FOREMOST! Since...
Famous old "999" scorched the rails at 112 mph in 1893
The "Oceanic" ushered in the luxury ocean liner era in 1870
The 5th Ave. Double-deck bus appeared in 1905
The year of the Model T, 1908, led to America on wheels
Cross-country air service in 1930 introduced mass air travel
1882 J.H. WILLIAMS & CO. BUFFALO N.Y. 75th Anniversary 1957
WILLIAMS TOOLS OF INDUSTRY

Since 1882, Wiliams has anticipated the tool requirements for production and maintenance in the transportation industry. Among the hundreds of patterns and sizes of tools which Williams forges are Carbon Steel Wrenches... Alloy Steel Superrenches® and Supersockets®... and a wide range of extra tough "C" Clamps.

TODAY... Williams makes the *Broadest Line of Its Kind* for this and other important industries. Write for Catalog 303.

YOU GET QUICKEST DELIVERY AT LOWEST COST FROM YOUR LOCAL DISTRIBUTOR.

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WE HAVE A WEATHER EYE FOR... GOOD SUPPLIES

...and give complete coverage of this area

The MISCO KID keeps his eye peeled for the highest quality supplies—the kind that do a better job for you, and that match MISCO service. That's why so many oil men have learned to call MISCO first—it costs them less in the long run with fair, square, and dependable dealings. *Expanded* MISCO *service now available in Texas.*

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WEST VIRGINIA
Parkersburg

EQUIPMENT MEN . . . in the News

Franks Division Will Move Tulsa Plant to Pampa, Tex.

Manufacturing facilities and employes of Franks Division, Cabot Shops, Inc., will be moved from Tulsa to Pampa in the near future, according to R. A. Baker, vice president and general manager of Cabot Shops.

Operation of sales and service facilities will be continued in Tulsa in a new sales and parts stock building which will be built soon. Baker said the move is made to consolidate overhead and manufacturing costs with the Cabot plant which has modern material-handling facilities, better arrangement, and modern machine tools.

Oilwell Makes Central Midwest Area Appointments

Milton A. Grappe has been appointed district representative at Pampa, Tex., for United States Steel Corp.'s Oil Well Supply Division, according to William Miskimins, Central Midwest area manager of the division. Gordon C. Shay, Jr., has been named manager at the Pampa store and Harold S. Tipton manager of the Sundown, Tex., store.

Richard E. Yates, store manager at Sundown, has been transferred to Monahans, Tex. Benjamin F. McIntosh, field representative, has been moved from Sherman to Wichita Falls, Tex. Appointed as field representative at Odessa is George A. Boring.

Grappe, who joined Oilwell in 1947, served as field representative at Albany and Borger, Tex., and in 1955 was appointed store manager at Pampa. Shay, with the division since 1951, was appointed field representative at Wichita Falls in 1954. Tipton served Oilwell at Odessa, Denver City, in 1953 was appointed field representative at McCamey, and was transferred to Odessa in 1955.

Employed by Oilwell in 1948 at Anson, Tex., Yates served at the Odessa store, was appointed field representative at Odessa in 1953, store manager at Sundown in 1955. McIntosh served Oilwell as field representative at Gainesville and Sherman, Tex. Boring was employed in 1955 at Odessa.

P.E.P.A. Elects Board of Directors for 1957-58

Petroleum Electric Power Association elected the following board of directors at its twenty-ninth annual meeting held in Amarillo, Tex., recently: (standing) Harvey Cherry, Houston Lighting & Power Co.; R. W. Williams, Community Public Service Co.; G. F. Delery, Louisiana Power & Light Co.; Rex N. Brown, Southwestern Public Service Co.; J. F. Maddox, New Mexico Electric Service Co.

Seated: H. P. Lindsey, Arkansas Power & Light Co.; Harold Nay, Kansas Gas & Electric Co.; Tom Graham, Oklahoma Gas & Electric Co.; W. M. Larkin, Gulf States Utilities Co.; B. F. Thompson, Public Service Co. of Oklahoma.

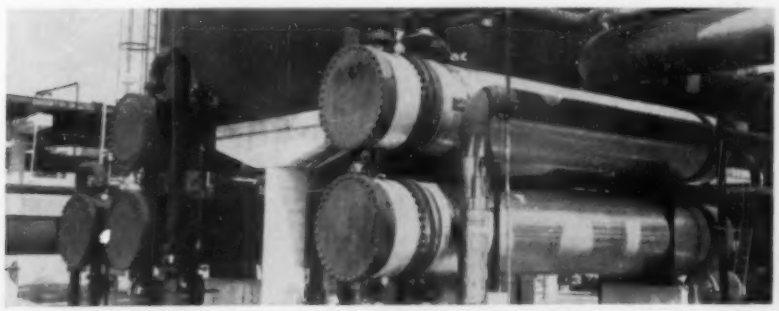
Chiksan Directors Elect Gates as Vice President

JOHN W. GATES

The board of directors of Chiksan Co. has elected John W. Gates, sales manager for Well Equipment Manufacturing Corp., Houston, vice president of Chiksan. In making the announcement, H. J. Hagn, Chiksan president, explained that Gates will continue in his present executive capacity with Weco. Weco is a division of Chiksan Co., which in turn is a subsidiary of Food Machinery & Chemical Corp.

Gates has been with Weco 11 years, having started as a shop supervisor, and served as field salesman and division sales manager before being named sales manager in 1951.

Gates joins one other Weco executive, J. H. Robinson, general manager, as a Chiksan vice president.



TMF Exchangers Give Plant High Thermal Efficiency

Texas Butadiene & Chemical Corp.'s new plant near Houston has 144 heat exchangers of varying size which greatly lessen the over-all fuel requirements of the plant through utilization of waste heat. Texas Metal Fabricating Co. furnished about 80 per cent of the exchangers in the plant. The company designed, engineered, and fabricated for the plant, heat exchangers with a total of about 300,000 sq. ft. of tube surface. This amounts to about 300 miles of tubes. This surface is sufficient to exchange about 1¼ billion B.t.u. per hour in normal operation.

Barnes Named Southern Geophysical Vice President

Addison L. Barnes has been appointed vice president of Southern Geophysical Co. and will be based at the firm's Midland, Tex., offices. In making the appointment, Dr. Sidon Harris, president of the Fort Worth firm,

no one coat does it...

one source does

Valdura offers maintenance paints made from specific resins for every condition

EPON

VAL-CHEM. Versatile, chemical resistant metal primer for use under any finish coat. VALPON ENAMEL. Prevents damage by oils, solvents, alkalies and other chemicals on wood, metal or masonry.

PARLON

PARAVAL ENAMEL. Not affected by acids, alkalies and other chemicals. Used on wood, metal, concrete or masonry. RUBBER BASE ENAMEL. Combines excellent exterior durability with high chemical resistance.

BAKELITE

SUPER SERVICE ENAMEL. Resists chemical, moisture and abrasive conditions on metal wood or masonry. ASPHALT ALUMINUM PAINT. 98% waterproof metal coat prevents rust, rot, corrosion. Highest reflectivity.

COAL TAR

SEWAGE DISPOSAL BLACKS. Used for protecting concrete and metal surfaces from water, etc., found in sewage plants, reclamation projects, refrigeration systems, metal and concrete pipe, marine exposures.

URETHANE

URAVAL. The very latest type of coating that combines the ultimate in resistance to chemicals, solvents, marring and abrasion. Uraval will stand up where all other types of coating have failed.

ALKYD

M & F ENAMEL (General Maintenance), VALKOTE (Implement Enamel), DARYWHITE. Products that utilize the outstanding durability of alkyd resins. All these coatings are hard, tough, quick drying and color retentive.

Valdura maintenance paints are stocked by leading industrial distributors everywhere!

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PAINTS THAT ENDURE

VALDURA
HEAVY DUTY
PAINT DIVISION
AMERICAN-MARIETTA CO.
101 E. Ontario St., Chicago 11, Ill.
687 Wellington St., Ottawa, Canada

stated that Barnes will direct seismic operations in the Permian Basin and related areas.

Barnes was in the geophysical department of Gulf Oil Corp. from 1937 to 1945. He then joined Nance Exploration Co. as supervisor where he remained until 1951, at which time he directed his own company.

In addition to offices in Fort Worth and Midland, Southern Geophysical has offices in Grand Junction, Colo., Houston, and New Orleans.

Southwest Industries Elects Vice Presidents

The election of Charles H. Swartz and Jack L. Mershon as vice presidents of Southwest Industries, Inc., has been announced by Jay L. Cannon, Jr., president.

C. H. SWARTZ

J. L. MERSHON

Swartz has been with Southwest 2 years in sales engineer work. Previously, he was in the gas department of Gulf Oil Corp. He will continue to headquarter in Houston.

Mershon, who will continue to manage the Tulsa office, has been with Southwest 2 years. Prior to that he was with Kellogg Co. and Refinery Engineering.

Southwest Industries is building a new plant in the Lumpkin industrial district of Houston.

Tube-Kote, Inc. Appoints Ramey, Edgar, Goodman

B. J. RAMEY

The appointments of B. J. Ramey as Tube-Kote, Inc., general sales manager, L. C. Edgar as technical director, and Barnard P. Goodman as research director have been announced by C. N. Posey, general manager of Tube-Kote.

Prior to his new position, Ramey has been sales engineer and sales coordinator. Edgar has been with Tube-Kote 9 years. He has served in various technical and research positions during his employment. He will con-

CLEAN* SEPARATION

*99.9% plus with

YORKMESH DEMISTERS
(MIST ELIMINATORS, ENTRAINMENT SEPARATORS)

YOU present your problems...

YORK will recommend and deliver the answer!

Why not take advantage of our vast experience in improving the performance of process equipment. In the past 10 years, the outstanding success of thousands of installations is proof of the superiority of YORKMESH DEMISTERS for entrainment control.

Yorkmesh Demisters are used to improve product quality, to avoid losses, and to increase thruput capacity. Our engineers will give careful consideration to the information you submit and will recommend the best answer to your problem.

YORKMESH DEMISTERS
improve the performance of:

Vacuum Towers • Distillation Equipment • Gas Absorbers • Scrubbers • Evaporators • Knock-out Drums • Steam Drums

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OTTO H. YORK CO., INC.
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Tylose

the water loss reducing agent

For all kinds of mud:
B 77 – the versatile low viscosity grade CMC

For special mud jobs:
BT – the **extreme** low viscosity special brand

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Utilize the world-wide experience of our mud engineers.

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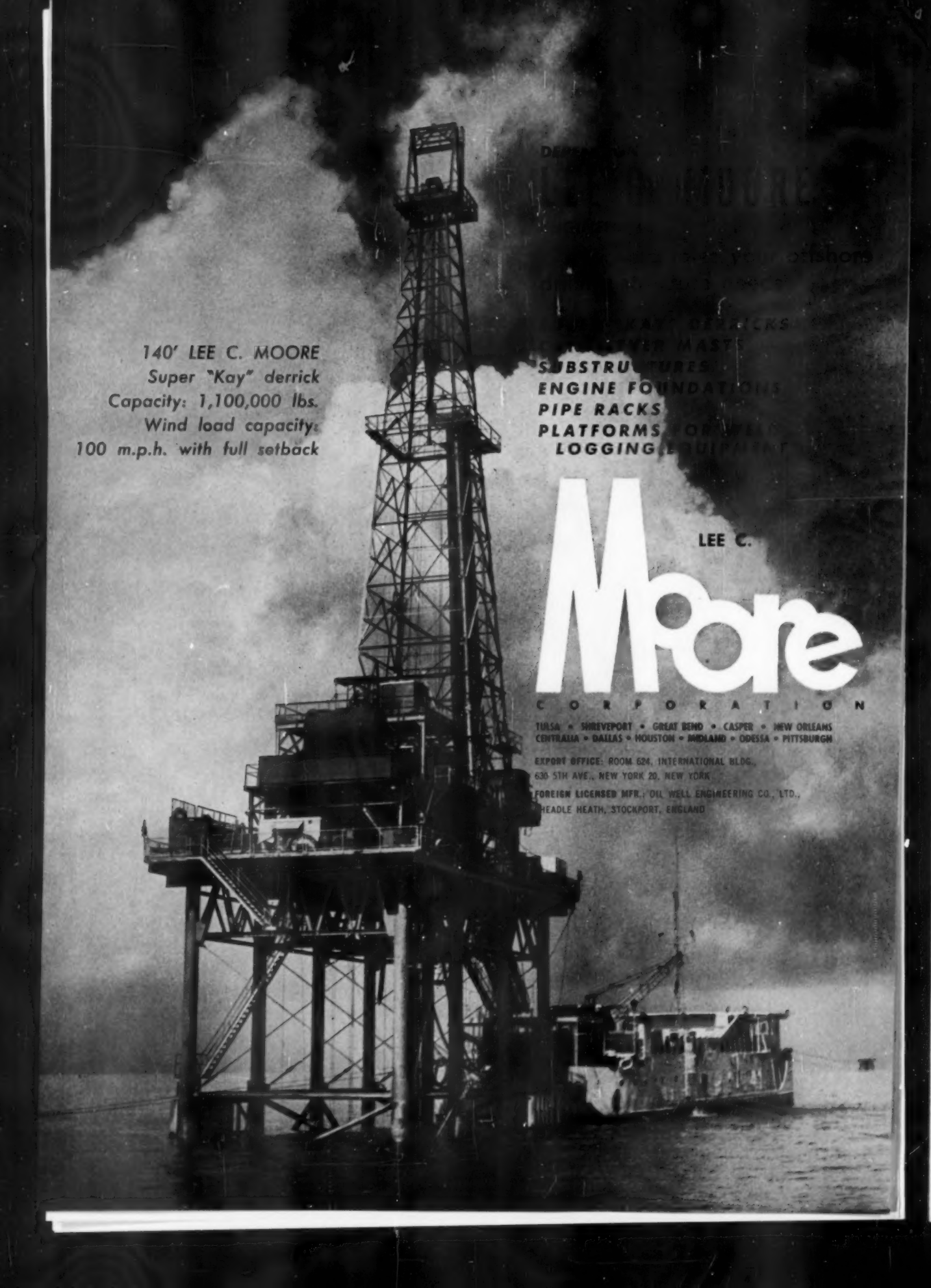
140' LEE C. MOORE
Super "Kay" derrick
Capacity: 1,100,000 lbs.
Wind load capacity:
100 m.p.h. with full setback
ENGINE FOU
PIPE RACKS
PLATFORMS
LOGGING
LEE C.
Moore
CORPORATION
TULSA • SHREVEPORT • GREAT BEND • CASPER • NEW ORLEANS
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630 5TH AVE., NEW YORK 20, NEW YORK
FOREIGN LICENSED MFR.: OIL WELL ENGINEERING CO., LTD.,
HEADLE HEATH, STOCKPORT, ENGLAND

tinue to report to E. G. Holm, former technical director, who was promoted to assistant general manager several months ago. Prior to his promotion, Goodman was a research chemist at Tube-Kote.

District Sales Managers Appointed by Rockwell

Dr. Charles J. Kentler, Jr. and Charles B. Goff, Jr. have been named district sales managers for the New

DR. KENTLER

C. B. GOFF, JR.

York and Pittsburgh districts, respectively, of Rockwell Manufacturing Co.'s meter and valve division, according to Lloyd A. Dixon, Jr., vice president.

Prior to his appointment, Kentler was a sales engineer in Rockwell's New York office. Goff was previously assistant product manager for Rockwell-Nordstrom valves, with headquarters in Pittsburgh.

Kentler joined Rockwell in 1950 as an applications engineer. In 1953 he was named technical consultant to the meter and valve division and later transferred to New York. Goff joined Rockwell in 1949 as a sales engineer in Pittsburgh. He moved to Cleveland in 1950 and in 1956 became assistant product manager, Rockwell-Nordstrom valves, and manager of industrial distributor sales.

New Mid-Continent Shop, Office Opened by Cummins

Cummins Sales & Service, Inc., has extended Mid-Continent facilities with the recent opening of a new shop and office at Biloxi, Miss. The installation provides sales and planning assistance, shop and field service, and makes Cummins diesel parts readily available.

The new Biloxi diesel shop is located to serve truckers, boat operators, and other diesel engine users. The facility is the fifteenth in a network of installations serving Texas, Oklahoma, Kansas, Louisiana, and Mississippi. Additional service points are at Farmington and Hobbs, N. M.

Cummins also announced plans for a new diesel shop and office at Wichita, Kans., to replace existing facilities there.

New Agency, Staff Changes Announced by LeTourneau

Appointment of a new advertising agency has been announced by R. G. LeTourneau, Inc. of Longview, Tex. Louis A. Flora, advertising manager, named D'Arcy Advertising Co. to handle the advertising and promotion programs for the six LeTourneau sales divisions.

D'Arcy stated that the LeTourneau account will be handled from its Dallas and Houston offices. J. Bob Wilson will be the agency's account supervisor, Norman Rau account executive, and Ira Hamilton copy contact man.

Flora also made known a recent regrouping of his own advertising personnel. Stan H. Fain was promoted from advertising supervisor to assistant advertising manager. He will assist in administration of the advertising division and be responsible for promotion of marine and industrial equipment and custom-engineered products.

Ernest W. Bracewell was advanced from assistant to the manager to advertising supervisor. He will be responsible for promotion of logging, land clearing, and transportation equipment. Nat

A Better Traveling Block
for Every Purpose
40 — 500 TONS
Extra weight and balance for "non-wobbling" falls.
Johns-Manville "Klipper" grease seals.
Easy opening guards, no bolts to take out and lose.
Extra large bearing diameters.
McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

Announcing...

JOHNSTON

Hydraulic

PUMPING UNITS

"THE MOST ECONOMICAL PUMPING UNIT EVER BUILT"

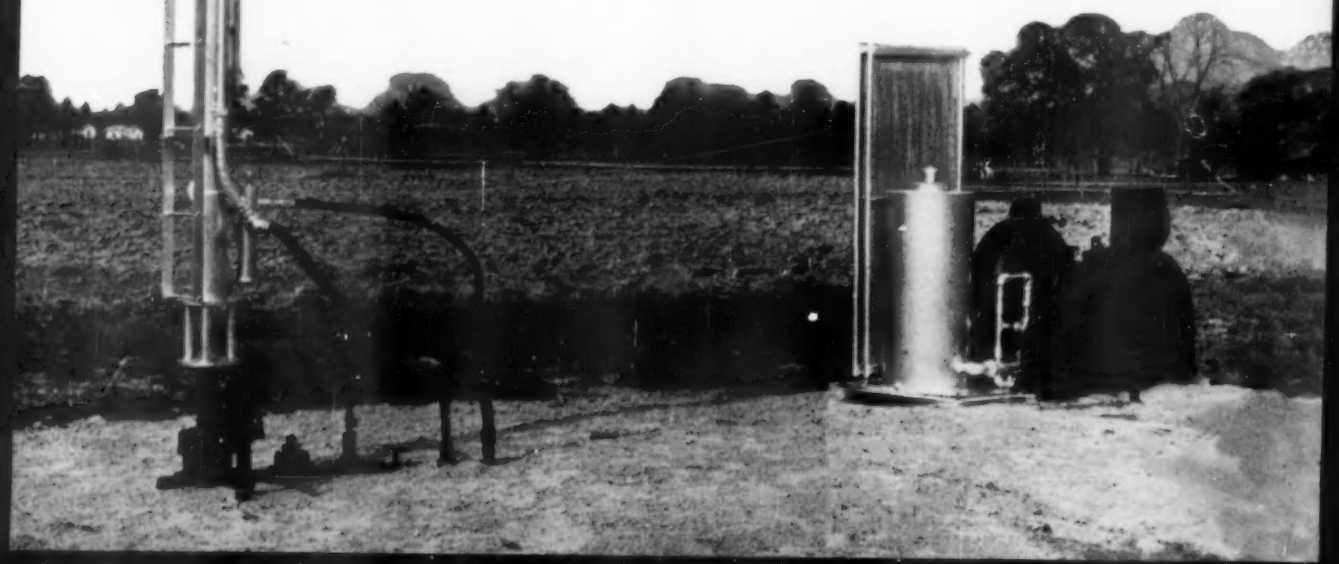
12-FT. STROKE

CYLINDER MODEL 4512

15,000 LB.

POLISH ROD LOAD

Yes—Here is the Hydraulic Pumping Unit the Industry has long needed—simple, sturdy, trouble-free and priced substantially lower than any other type pumping equipment, mechanical or hydraulic.



THEY ARE PROVEN

THEY ARE BETTER

THEY COST LESS

From grass roots to 9000 feet—that's the range of Johnston Hydraulic Pumping Units. More than 100 of these units are now in service (Gulf Coast, South Texas, West Texas), and have been operating for a sufficient length of time to prove their merit.

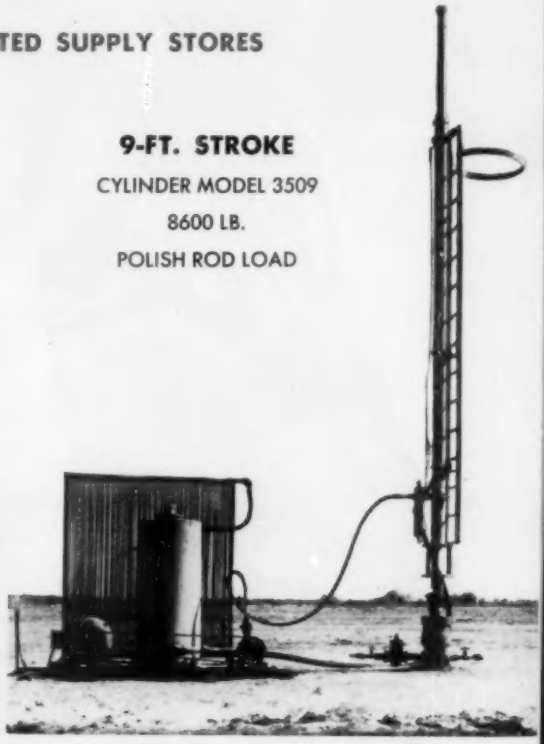
The low price of Johnston Hydraulic Pumping Units is due to streamlined, simplified design and manufacture, made possible by years of experience in production and hydraulics.

Remember this: Here is a pumping unit that will SAVE YOU MONEY —Cost You Less than any competitive unit; Less for Transportation; Less for Installation; Less for Maintenance; Increase Life of Sucker Rods, Bottom Hole Pump, and in many instances increase production.

DISTRIBUTED THROUGH SELECTED SUPPLY STORES

6-FT. STROKE
CYLINDER MODEL 3006
6000 LB.
POLISH ROD LOAD

9-FT. STROKE
CYLINDER MODEL 3509
8600 LB.
POLISH ROD LOAD



THE "PEE WEE"
(3-FT. STROKE)
CYLINDER MODEL 2503
4000 LB.
POLISH ROD LOAD

MAIL THIS COUPON FOR SPECIAL PAMPHLET CONTAINING APPLICATION CHART AND MECHANICAL FEATURES OF JOHNSTON HYDRAULIC PUMPS . . . NO OBLIGATION.

ENGINEERED OIL TOOLS, INC.
P. O. Box 1665 • Houston, Texas
Please mail special pamphlet on Johnston Hydraulic Pumps to:

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DISTRIBUTED THROUGH SELECTED SUPPLY STORES BY

ENGINEERED OIL TOOLS, INC.

1710 BURNETT ST. — HOUSTON, TEXAS

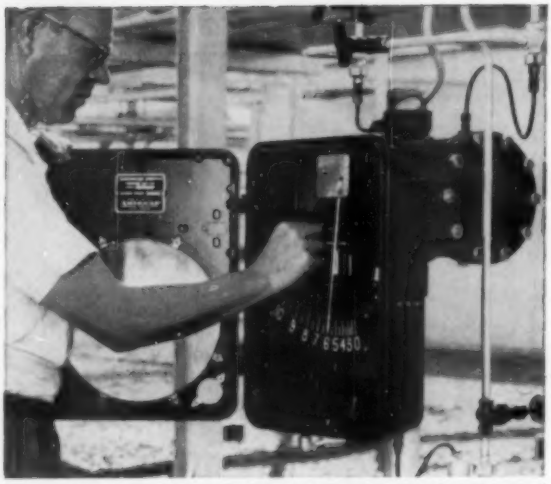
Fact 1

Once in a while a better product is made, and made so well, that it becomes the standard by which all similar products are judged.

Fact 2

The preference that you and millions of other users have shown for the RIGID Pipe Wrench puts on us the responsibility of keeping it always up to the top quality you expect of it.

The Ridge Tool Company, Elyria, Ohio, U. S. A.

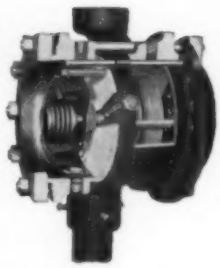


You can't match AMERICAN® DRI-FLO METERS for versatility

You can't match American® DRI-FLO Meters for versatility, accuracy and proven dependability.

Above, an American DRI-FLO Meter is used to measure ethane reflux flow on a de-ethanizer unit in a gasoline plant at 500 psi and 80 to 100° F, typical of one of the many installations meeting the most exacting requirements.

Below, a DRI-FLO manometer is shown measuring lease gas and is used in conjunction with a 30-year-old recording mechanism — proof of the versatility and long service life built into American products.



DRI-FLO Meters bring American-Westcott precision, simplicity of installation and maintenance, with maximum resistance to corrosive materials, to orifice meter measurement. Differential ranges: 20", 50", 100", and 200"; Working pressures 1000 and 5000 psi; Ambient temperatures of —25 to 175°F.

Write for full information.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. • Albany Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood. IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

Jones, public relations supervisor, was made responsible for promotion of over-all company identification, in addition to trade publicity and general public relations.

Schlumberger Names Managers, Sales Engineers

T. E. Swilley has been promoted by Schlumberger Well Surveying Corp. to manager of the Lake Charles district, and H. C. Thomason is now manager at Medicine Lodge, Kans.

R. W. Bashe, formerly district manager at Ardmore, Okla., is now senior sales engineer in the Oklahoma division. J. E. Rose has been named sales engineer at Ardmore.

Continental-Emsco Co. Promotes Ramey, Robinson

T. A. Ramey has been appointed assistant manager of Continental-Emsco Co.'s export division, New York City.

T. A. RAMEY

R. H. ROBINSON

Ramon H. Robinson was named to the post of manager, distributor department in Dallas.

Ramey joined Emsco Manufacturing Co. in 1953 as sales manager for drilling machinery at the Dallas office. With the recent consolidation of Continental Supply Co. and Emsco Manufacturing Co., Ramey was appointed manager of distributor sales.

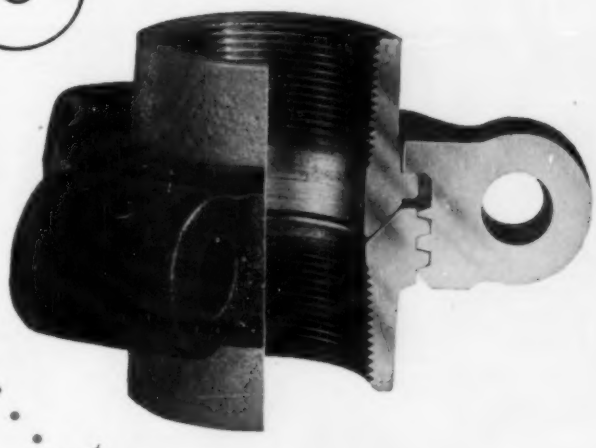
Robinson was named distributor machinery specialist for Continental-Emsco in January 1957. He joined Emsco as a service engineer in 1947 and in 1950 was promoted to machinery salesman.

Texas Instruments Ships Electronic Brain to Paris

To make more effective the intensive search for European petroleum, a seisMAC electronic brain has been flown to Paris, according to R. W. Olson, vice president of Texas Instruments, Inc., industrial instrumentation division.

The shipment of geophysical equipment was purchased by Seismos G.M.B.H., a German geophysical company, for use by its wholly owned sub-

THE 3 MOST IMPORTANT FUNCTIONS OF A UNION



LEAK-PROOF SEALING—
EASY MAKE-UP AND BREAK-OUT—
LONG LIFE are basically the most important functions of a union. All are synonymous with Weco Unions.

Leak-proof sealing is the result of Weco's ball and cone seat that forms a metal-to-metal surface unequaled for positive sealing. Easy make-up and break-out is provided by Weco's precision machined Acme threads. The long life of Weco Unions comes from sturdier construction of sub ends and wing nuts that can take the toughest treatment a worker can hand them—and come back for more—month after month.

These time-and-money-saving functions make Weco your best union buy today. Get them at supply stores everywhere.

U-1-56

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

Neat and compact describes perfectly this modern compressor station in one of the Houston, Texas suburbs.

99.35% AVAILABILITY

with Cooper-Bessemer compressors at Liquigas

At the end of 24 months continuous operation, these four engine-driven Cooper-Bessemer GMVA compressors report a remarkable availability average of 99.35%.

Here, in the Fairbanks, Texas station of The Liquigas Company, tail gas is picked up at approximately 30 psig and boosted to 800 psig, then injected into pipeline at the rate of 20 million cubic feet per day.

The efficiency, economy and high availability of this modern compressor plant is typical of Cooper-Bessemer performance throughout the world. Because of this dependability and the continuing service of experienced Cooper-Bessemer personnel, you can readily see why more and more compressor jobs are going to Cooper-Bessemer. Get *complete* details for yourself. Contact the office nearest you, today.

BRANCH OFFICES: Grove City • New York • Chicago • Washington • San Francisco • Los Angeles • Houston • Dallas • Odessa • Pampa • Greggton • Seattle • Tulsa • St. Louis • Kansas City • Minneapolis • New Orleans • Shreveport

SUBSIDIARIES: Cooper-Bessemer of Canada, Limited . . .
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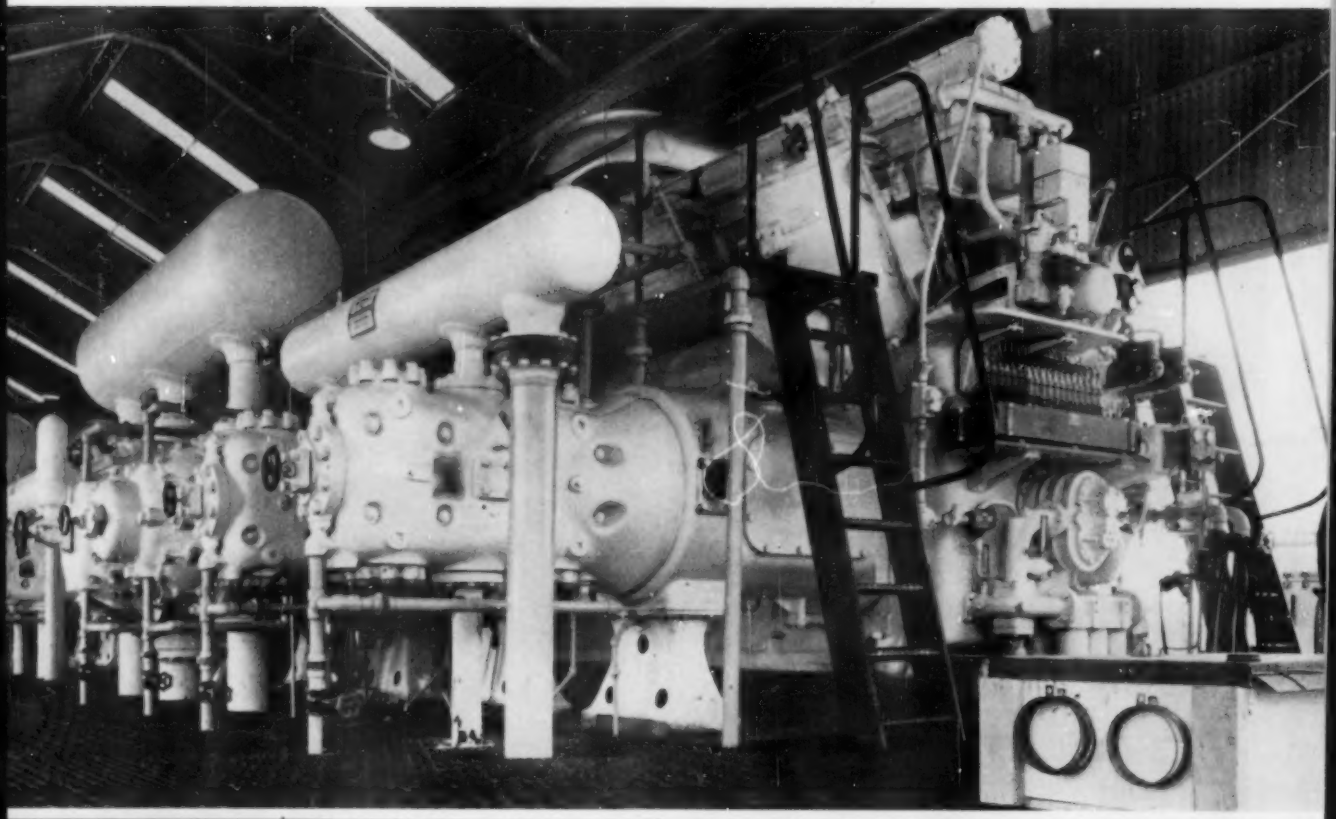
Cooper/Bessemer

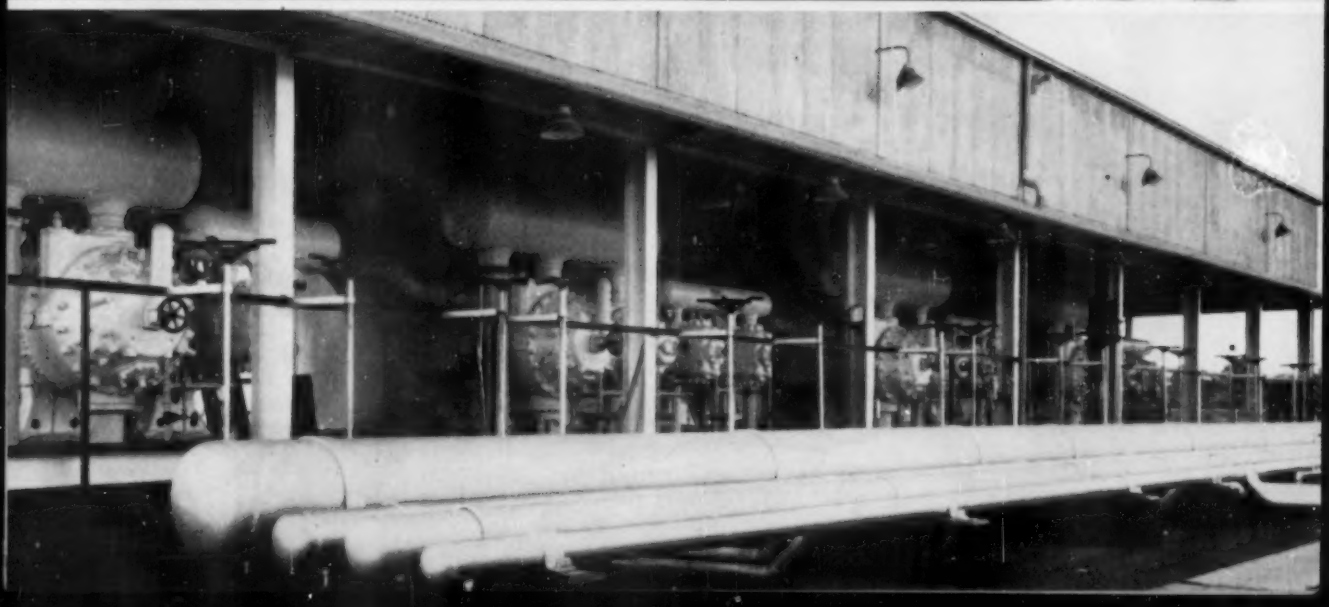
GENERAL OFFICES: MOUNT VERNON, OHIO

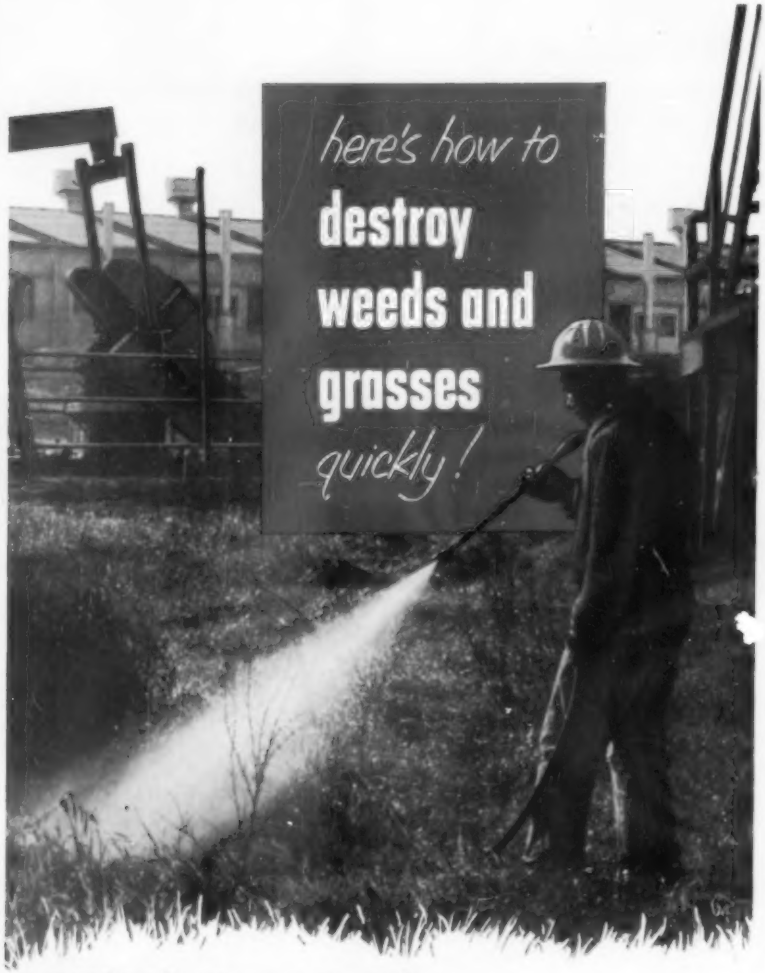
ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

A *In the Fairbanks station of The Liquigas Company, a subsidiary of The Murmanill Corporation . . . three 8-cylinder Cooper-Bessemer GMVA's rated 1100 hp at 300 rpm and one 4-cylinder GMVA rated 540 hp at 300 rpm.*

B *Noted for "pulling ability", Cooper-Bessemer engine-driven compressors at Fairbanks deliver long-life service with minimum maintenance.*







protect your property against grass fires

by applying POLYBOR-CHLORATE®

Destroy *all* vegetation to get maximum safety. It's easy with POLYBOR-CHLORATE weed killer! This potent combination, borates and sodium chlorate, is unequalled for fast killing with safety. POLYBOR-CHLORATE is highly soluble; works well in any spray equipment but can be applied dry with equally effective results. Spraying is a quick way to destroy tall standing vegetation where mowing or scalping is not feasible. Residual effects, often preventing regrowth for a year or longer, mean added economy. Get full information by writing today!

FAST-ACTING
NONFLAMMABLE
NONSELECTIVE
ECONOMICAL
CONVENIENT

United States Borax & Chemical Corporation
PACIFIC COAST BORAX COMPANY DIVISION
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DISTRIBUTORS LOCATED THROUGHOUT OIL FIELDS OF U.S.A., CANADA, MEXICO, COLUMBIA, VENEZUELA.

sidiary, the Societe Seismique Gravimetrie, Paris.

This seisMAC (seismic magnetic automatic computer) is the first of four being exported overseas this year, Olson said. The seisMAC represents an important development in the field of seismation, which is the extension of automation to the field of geophysical exploration.

Hycalog Promotes Bynum And Woods to New Posts

W. W. BYNUM

JAMES WOODS

W. W. Bynum, vice president, has been promoted by Hycalog, Inc. to vice president in charge of sales and service for well logging, Spectra-Scan logging and field gas recording. James Woods has been promoted to vice president in charge of sales and service for diamond coring, core analysis, diamond bits, drill bits, diamond core barrels and parts. These appointments were announced by Max Bowerman, general manager.

J. R. Mayeaux, president, said that these are new positions created by a recently completed general reorganization. By grouping into two divisions, the company is able to offer more flexible specialized service to customers.

Both Bynum and Woods have been with Hycalog since 1946.

F. E. Backus Heads Midwest Sales for Darling Valve

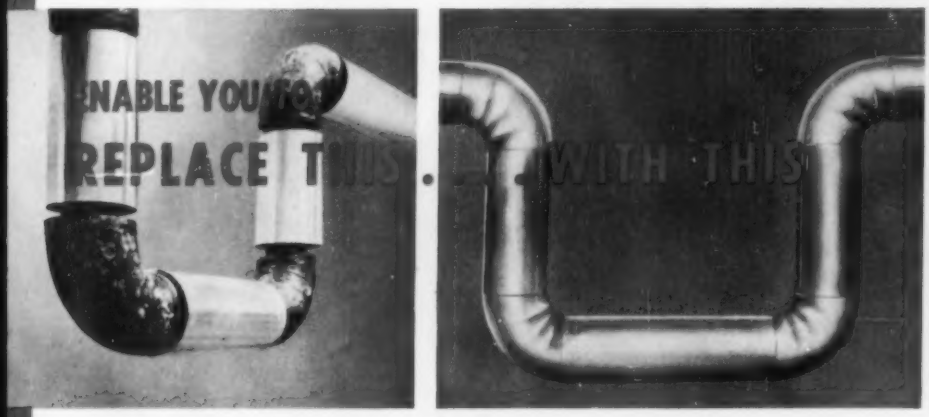
F. E. BACKUS

The appointments of Foster E. Backus as Midwest regional sales manager and Robert C. Gaynor as a new sales engineer have been announced by D. F. Sable, general sales manager of Darling Valve & Manufacturing Co., Williamsport, Pa.

With office headquarters at Toledo, Ohio, Backus will supervise sales activity in the 13-state area from western Pennsylvania to the Dakotas and south to Kentucky. Gaynor, also headquartering in the regional office at Toledo, will concentrate his efforts in Michigan and adjacent parts of Indiana and Ohio.

Attention, designers and maintainers of oil refineries and chemical plants:

ALUMINELS®



manufactured exclusively by
PREFORMED METAL PRODUCTS CO.
patent pending

It'll pay you to check on PREMETCO's new aluminum ell jackets that look better and cost less than ugly, makeshift "problem ells" on insulated pipes

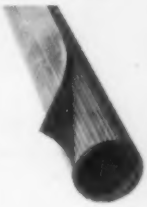
The Premetco Aluminel (patent pending) is a two-piece preformed aluminum ell jacket that snaps on quickly and protects insulated pipe better, longer and hence more economically than any other ell covering method. It is available for 90-degree ells in the seven most used pipe sizes; with variations in each size for desired insulation thickness. Look at its advantages:

- **LOWER COST** —Reduces initial costs, installation time and maintenance.
- **BETTER PROTECTION** —Presents only two longitudinal seams, which have a preformed 2" lap, and joins smoothly with straight jacketing. Coated internally with vapor seal barrier.
- **BETTER LOOKING** —Ends unsightly corners, enables you to cover 100% of your insulated pipe with sparkling, non-corrosive aluminum.

Complete Data on Request.

Aluminels work in conjunction with these other Premetco products:

- **PREMETCO JACKETING** – High purity aluminum jacketing (3/16" either corrugated or smooth) for weatherproofing all types of insulated pipelines, vessels, towers or tanks. Competitively priced, precision engineered, and available in standard thicknesses, with moisture barrier attached. Suitable for application by strapping or sheet metal screws and also designed to work with Premetco Adhesive 1.



- **PREMETCO ADHESIVE 1** – A weather-proof, catalyzed, epoxy-based adhesive specifically designed for *applying both straight and ell jacketing to insulated pipe*. Applied cold (can be brushed or sprayed on) with result that jacketing application time is greatly reduced over conventional strapping-and-screws methods.

- **PREMETCO BEAMSHIELD** – A slip-on, double constructed sheet metal cover (prefilled with 2" of mineral wool) which protects exposed I-Beam pipe rack stanchions from structural weakness caused by flash floor fires in refineries, gasoline or chemical plants. Built to your specifications. Beamshield covers are easily installed and relocated, completely waterproof, thus offering highly efficient and economical protection.

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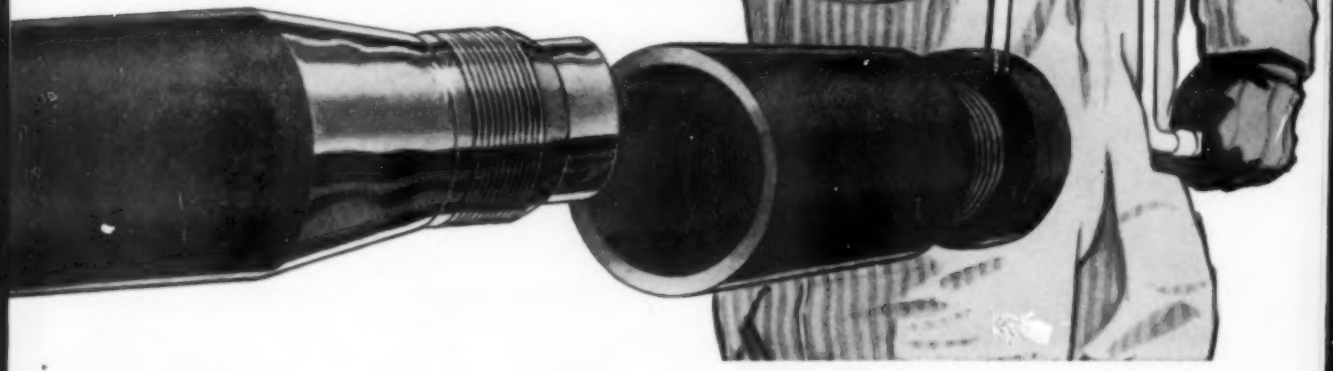
You get longer life from your drill collars at the same time because with Rol-Flex Replaceable End Drill Collars you don't re-thread . . . you install a new connector, thereby saving every inch of your drill collar. Rol-Flex Connectors are completely replaceable at your rig . . . wherever it is!



EASY INSTALLATION

EASY REMOVAL

AMERICAN IRON & MACHINE WORKS CO. INC. — MANUFACTURERS OF OILFIELD EQUIPMENT — OKLAHOMA CITY

Additional Rol-Flex information available upon request.

Another AMF Product — PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.—Oklahoma City, Okla.—Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

Backus, with 10 years of sales experience with Darling, moves into his new post from the territory now served by Gaynor as a sales engineer. Gaynor was previously with Continental Can Co.

Cooper-Bessemer Appoints McDougall Branch Manager

L. McDOUGALL

C. L. McDougall has been appointed branch manager of Cooper - Bessemer Corp.'s field office at Odessa, Tex., according to A. A. Burrell, vice president and southwestern district manager. McDougall will direct field sales and service activities in the West Texas area. His assignment fills the position left by A. Abel, who has taken up a new Cooper-Bessemer post as branch manager at Tulsa.

McDougall received his compressor engineering training at Mount Vernon before assignment to Odessa as sales engineer in 1950.

Working with McDougall is W. J. Burkstaller, recently appointed to Odessa as sales engineer. Burkstaller will concentrate on the application of engine - driven and motor - driven compressors in West Texas.

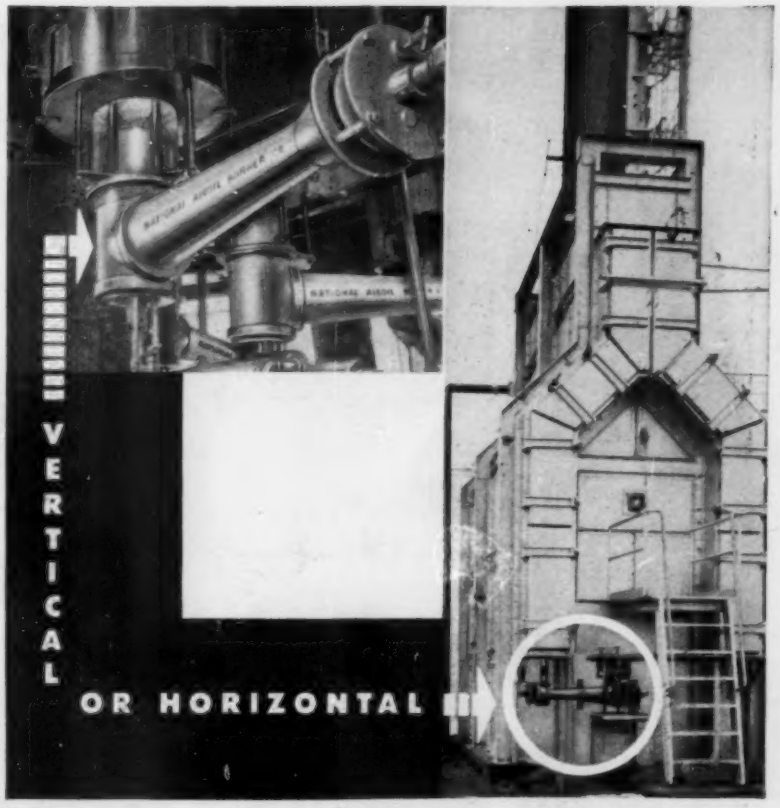
Alco Products Names Agent In Southern California

The appointment of Walter W. Perkins, Los Angeles, as exclusive agent in southern California for Alco-Twin finned tube heat exchangers and other longitudinal fin-tube products has been announced by Alco Products, Inc.

Perkins represents five other manufacturers of various products in the general area covered by the Alco agreement. He has had experience as a rating, design and sales engineer in the manufacture of cooling towers and in the development of air-cooled heat exchangers.

Goodyear Transfers Shofner to Oklahoma City

S. L. Shofner, a member of Goodyear Tire & Rubber Co.'s sales division since May 1956, has been transferred to the firm's Oklahoma City district as a petroleum sales representative. Following a period of training in his new capacity, he will represent Goodyear in customer contacts with manufacturers of petroleum and allied products.



many more hours on stream without forced shutdown with NATIONAL AIROIL

OIL-GAS TANDEM COMBUSTION UNITS

Exclusively for vertical firing, the new National Airoil VERTICAL Tandem Block Units retain all the features of our regular horizontal Tandem Units . . . *plus:* special, pre-cast refractory shapes for easier, cost-saving vertical installation and maintenance; secondary air inlet louvres for positive control of vertical flame pattern; and, all steel duplex detaching gear which enables swift, simple vertical burner changeover.

VERTICAL and HORIZONTAL Tandem Units hold air in the combustion zone until fuel and heated air are thoroughly mixed. This means that ignition takes place in a hot zone; the result: high fuel economy through more rapid combustion with a minimum of excess air. NATIONAL AIROIL's patented Tandem Combustion Units allow secondary air to be easily and accurately controlled. By adjusting air control louvres, flame can be shaped to radiate heat uniformly without tube impingement.

The VERTICAL or HORIZONTAL Tandem Unit is always fired with NATIONAL AIROIL Combination Oil and Gas Burners . . . has a high turndown ratio with a steady flame temperature using either fuel oil or gas. With the TANDEM UNIT'S clean flame, a cold furnace can be brought to full capacity in a short time.

"Many, many more hours on stream, without shutdown" . . . yes, YOU will realize higher profits from YOUR heaters when NATIONAL AIROIL VERTICAL or HORIZONTAL Tandem Units are specified. Our new Bulletin 498 is yours for the asking.

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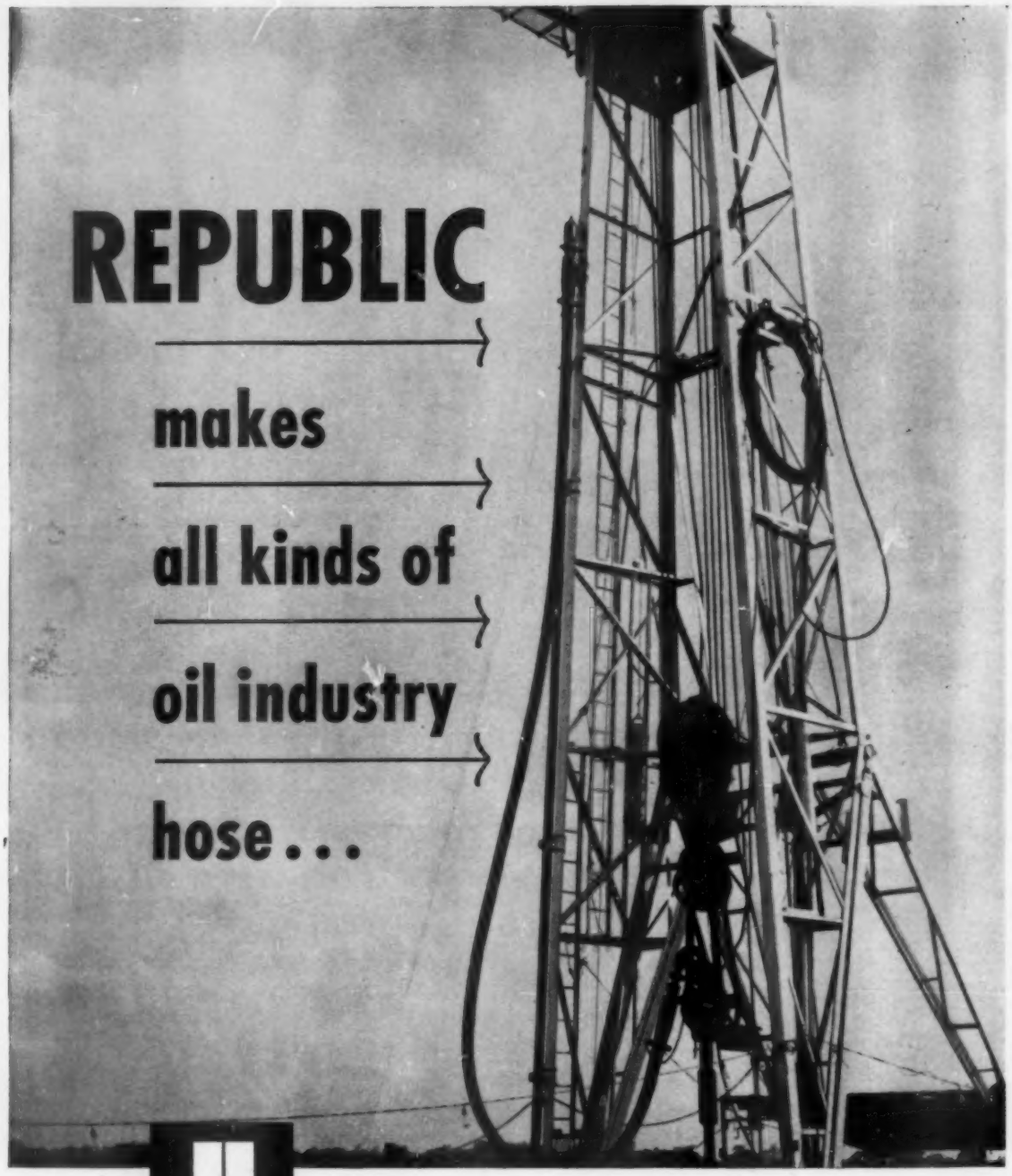
INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT



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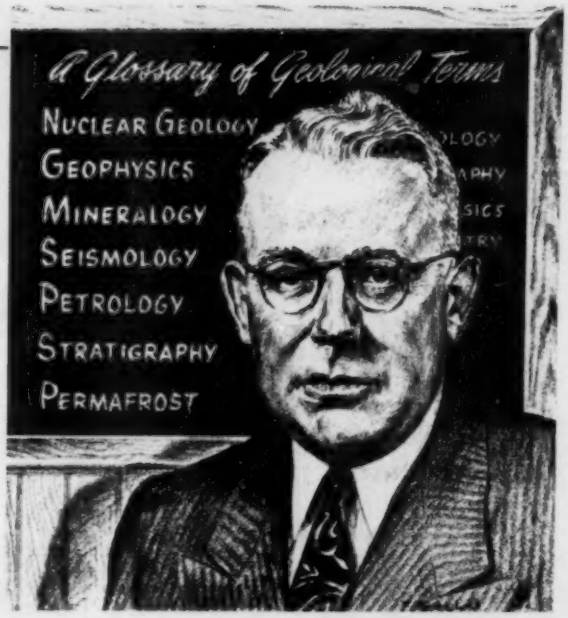
NOW—Geologists Have a Word For It, Too

. . . in their own brand-new glossary

By Frank J. Gardner



Dr. J. V. Howell was coordinating chairman of the Steering Committee responsible for the A.G.I.'s new "Glossary of Geology and Related Sciences," newly released compilation of 14,000 scientific terms used by the geological sciences.

GEOLOGISTS now have a word for it . . . anything from a- to zygote. The first comprehensive glossary of geology and related sciences has just been released by the American Geological Institute. Seven years of hard work went into it, and the end product is an extraordinary collection of 14,000 scientific terms not to be found in any comparable volume. A careful check of just two random pages, for instance, revealed that of 88 terms defined, 63 were not listed in any existing geological or petroleum dictionary nor in the Merriam-Webster dictionary.

From 90 specialists . . . This new publication is the result of the combined efforts of more than 90 specialists in the various fields of the geological sciences; that's a crew that no professional book manufacturer could ever hire. The specialties they represent cover the fields of coal, engineering, geology, geochemistry, geomorphology, geophysics, glacial geology, glaciology, hydrology, invertebrate paleontology (except morphologic terms), marine geology, meteorology, military geology, mineralogy, nuclear geology, ore deposits, paleobotany, permafrost, petroleum, petrology, sedimentology, seismology, speleology, structure, surveying and mapping, and stratigraphy (except stratigraphic names). Now that's quite an impressive field of coverage, and if you think that glacial geology and glaciology are the same thing, this book will straighten you out on that, too.

The man chiefly responsible for the compilation of this new contribution to geologic (not geological) literature is J. V. Howell, genial coordinating chairman of the Glossary Steering Committee. He and his committee, representing 13 major geological and engineering societies and associations in the United States and Canada, have guided the destiny of this long-awaited book since its inception.

A wealth of knowledge . . . The idea for the glossary was born in Tulsa in 1950. Geologists were complaining that there was no adequate source of definitions for hundreds of everyday geological terms. The Research Committee of the American Association of Petroleum Geologists was approached about the problem, and they suggested that it would be an appropriate project for the then-new A.G.I. The A.G.I. agreed to undertake it, and the book was on its way; Howell was appointed to ramrod it through. The Geological Society of America and the National Science Foundation underwrote the financing, and the A.G.I., operating under the National Academy of Sciences and the National Research Council, sponsored and assisted Howell and his steering committee. So you can see that within its covers, this 325-page glossary holds a wealth of knowledge and authenticity. Every available previous glossary, dictionary, card file, and private collection was drawn upon for material. Duplications, varied usages, obscurities, weird spellings, and a lot of other obstacles had to be overcome; this task fell largely upon the editor, Dr. A. C. Trowbridge, of Iowa University. But the clarity which radiates from every page of the finished volume will be a rich reward for every geologist in the business and a tribute to all who had a hand in the publication.

How many geologists (without looking) can clearly distinguish, for instance, among these terms: anticline, monocline, monoclinal flexure, unicline, pericline, perianticline, homocline, and isocline? Anaclinal, cataclinal, conclinal, and paraclinal?

And professional accuracy . . . Do you know the difference between a fiord and a fiard? Dilation and dilatation? Name 30 synonyms for hornfels. Is a centrocline a basin or a dome? It's been defined both ways! Ever heard of Writing Desk Mountain? Hoodoos? Cold noses? If not, then you'll do well to end the chaos (that's a rock, too) by sending $6 to the A.G.I. in Washington at once. Here's a book you're going to need, for no matter how many words you know, they're only sounds unless you know what they mean. An hour a day spent browsing through this glossary can spell a lot of improvement in your writing, your speaking, and your over-all geologic (not geological) knowledge. It may even help to improve this column, for the final touch of professional accuracy came with the careful checking of every term by the Journal's presentation editor, Lynn M. Nichols. He's one of the few people who have read every definition in the glossary, and while he may not remember every term, he has made the Journal's geological staff very self-conscious about its copy.

THE JOURNAL'S EXPLORATION SUMMARY FOR MAY
Ruegsegger Discovery Flows Silurian Oil
Second Donkey Creek Well Gets Pennsylvanian Oil
Paradox Play Moves into Colorado
New Nebraska Depth Record is 8,875 ft.
Paradox Rush Overflows In Three Directions
Woodward County Adds Second Field
Cherokee Interest Returns to Northern Oklahoma
Susie Confirmed
New Colorado Depth Record is 15,368 ft. Plus
Minden Salt Dome Produces in North Louisiana . . . the region's first salt dome production
Harnish Discovery Looms as Year's California Exploratory Highlight
Tidewater Hits at Significant Permian Basin Wildcat
Latest Play in Galveston Bay Nets Six Strikes
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
OREGON
COLORADO
KANSAS
NEBRASKA
ARIZONA
NEW MEXICO
OKLAHOMA
LOUISIANA

Geologically, Louisiana takes top honors for May, but . . .

New Oil Pours from the Paradox Basin

By John C. McCaslin
District Editor

GEOLOGICALLY, the exploratory highlight for May was the opening of production on the Minden salt dome in North Louisiana, but from the reserve standpoint the month's big development item was the continued flush discovery of oil in the Paradox basin. To round out a healthy wildcat program, wildcat news was made in the Anadarko basin, on the northern shelf of Oklahoma, on the Pacific Coast, in Galveston Bay, in the Williston basin, in the Powder River basin, Permian basin, and at deep wildcats in the Denver and Piceance Creek basins.

Another salt frontier invaded . . . Pan American Petroleum Corp. uncovered the first commercial production associated with salt domes in North Louisiana at its 1 Anna Hudson off the east flank of the Minden salt dome in Webster Parish.

The well had a calculated open flow of 9 M.M.c.f. of gas per day plus 13 bbl. of distillate per million cubic feet. Production is from perforations in the Paluxy sand at 7,460-66 ft.

There are 17 piercement salt-dome prospects in this region including the now-cracked Minden dome. The Pan American discovery tapped many evidences of faulting and structural complexities all around this dome that may lead to more oil and gas pools. The other 16 domes should offer the same promises of production. North Louisiana is the second salt dome region to fall before the drill in the past 2 years—the first was East Texas.

The Paradox basin explodes . . . May drilling in the prolific Pennsylvanian rocks of the Paradox basin in southeastern Utah netted five new discoveries. Here is the month's tally:

. . . Carter Oil Co. 1 Navajo-114, 3½ miles northeast of East Desert Creek field, was completed flowing 2,300 bbl. of oil per day from the Pennsylvanian at 5,546-96 ft., extending Aneth production 2 miles southeast.

. . . Superior Oil Co. completed 1 Navajo-E for 770 bbl. of oil per day from Paradox-Pennsylvanian at 5,445-5,518 ft., offsetting successfully the recent East Desert Creek field discovery.

Total May Completions, Exploration and Development

	Total completions							Total wildcat wells							Act.
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Total	Oil	Gas	Dry	Footage	C.T.	D.D.	op.
Alabama	12	9	0	0	3	0	123,350	3	0	0	3	19,937	1	1	19
Arkansas	74	50	0	1	23	0	224,733	15	3	1	11	43,088	0	0	113
California	226	164	0	3	59	0	919,082	53	8	0	45	306,693	0	0	221
Colorado	62	8	0	9	45	0	335,028	42	1	5	36	226,541	0	0	56
Florida	2	0	0	0	2	0	15,441	2	0	0	2	15,441	0	0	1
Illinois	254	92	0	3	159	0	571,882	64	3	0	67	127,170	49	7	377
Indiana	65	23	0	5	37	0	99,153	12	1	0	11	22,935	48	0	80
Kansas	348	149	0	24	169	6	1,244,695	74	5	3	66	303,439	19	0	440
Kentucky	133	50	0	20	63	0	200,705	18	2	1	15	23,476	109	0	204
West	111	49	0	2	60	0	136,984	18	2	1	15	23,476	100	0	151
East	22	1	0	18	3	0	63,721	0	0	0	0	0	9	0	53
Louisiana	336	182	0	46	108	0	2,704,622	58	7	11	40	582,498	0	0	485
North	103	66	0	7	30	0	363,232	13	3	2	8	57,704	0	0	128
South	166	75	0	33	58	0	1,700,921	37	2	9	26	435,264	0	0	254
Offshore	67	41	0	6	20	0	640,469	8	2	0	6	89,530	0	0	103
Michigan	42	17	0	0	25	0	112,978	15	4	0	11	40,305	32	0	92
Mississippi	42	11	1	0	30	0	324,042	24	3	0	21	182,812	1	0	38
Montana	43	21	0	0	22	0	209,265	17	2	0	15	81,884	11	0	68
Nebraska	90	24	0	0	66	0	526,686	56	3	0	53	319,706	0	0	52
West	89	24	0	0	65	0	523,475	55	3	0	52	316,495	0	0	50
East	1	0	0	0	1	0	3,211	1	0	0	1	3,211	0	0	2
New Mexico	189	92	0	51	46	0	821,516	17	3	1	13	96,097	1	0	218
Northwest	74	17	0	48	9	0	338,114	3	0	1	2	22,776	0	0	93
Southeast	115	75	0	3	37	0	483,402	14	3	0	11	73,321	1	0	125
New York	36	17	0	1	0	18	38,483	1	0	1	0	3,483	35	0	41
North Dakota	24	12	0	0	12	0	175,217	11	0	0	11	63,310	0	0	28
Ohio	97	52	0	16	17	12	233,937	0	0	0	0	0	95	1	111
Oklahoma	499	266	16	23	173	21	1,854,746	69	9	2	58	337,961	67	21	793
Pennsylvania	15	0	0	11	4	0	106,958	3	0	2	1	21,217	5	0	56
South Dakota	5	0	0	0	5	0	22,776	5	0	0	5	22,776	0	0	6
Texas	2,112	1,229	45	82	722	34	8,910,452	527	76	20	431	2,487,675	84	16	1,271
Dist. 1	103	59	1	1	42	0	262,520	32	1	0	31	101,562	2	0	43
Dist. 2	76	25	9	10	32	0	469,246	31	6	3	22	194,069	0	0	45
Dist. 3	159	69	10	6	74	0	1,058,169	41	3	2	36	334,057	0	0	123
Dist. 4	160	52	19	21	68	0	882,601	64	13	5	46	378,741	0	2	70
East	96	55	0	3	38	0	526,823	22	0	0	22	114,557	0	0	55
Dist. 7-B	313	152	0	5	156	0	1,083,333	136	22	2	112	462,317	41	5	87
West	585	449	2	7	125	2	2,844,301	95	15	2	78	542,560	36	5	594
Dist. 9	486	270	0	11	173	32	1,272,838	98	12	5	81	292,914	5	4	138
Panhandle	134	98	4	18	14	0	510,621	8	4	1	3	66,898	0	0	116
Utah	18	10	0	1	7	0	103,359	8	1	1	6	45,605	0	0	54
West Virginia	44	8	0	27	9	0	122,659	2	0	0	2	10,701	40	0	230
Wyoming	85	42	0	9	32	2	353,604	23	3	1	19	105,933	15	0	116
Total May 1957	4,853	2,528	62	332	1,838	93	20,355,369	1,119	*134	49	936	5,490,683	612	46	5,170
Total April 1957	3,857	2,103	41	252	1,374	87	16,154,585	818	109	32	677	3,988,950	562	36	5,077
Cum. 1957	22,013	11,600	198	1,592	8,144	479	91,599,488	5,033	621	208	4,204	24,577,668	3,192	220	
Cum. 1956	24,001	13,063	238	1,584	8,702	414	98,212,000	5,217	712	168	4,337	25,195,000	....	....	....
Western Canada	243	147	0	13	80	3	1,099,427	67	4	5	58	310,420	....	....	....
Alberta	105	65	0	10	30	0	542,518	25	2	4	19	143,779	....	....	....
Saskatchewan	114	73	0	0	40	1	474,284	32	1	0	31	120,884	....	....	....
Manitoba	15	8	0	0	5	2	31,313	4	0	0	4	10,055	....	....	....
British Columbia	8	1	0	3	4	0	48,851	5	1	1	3	33,241	....	....	....
N.W.T.	1	0	0	0	1	0	2,461	1	0	0	1	2,461	....	....	....
Canada cum. 1957	1,113	726	0	59	325	3	5,195,404	305	27	25	253	1,455,877	....	....	....
Alberta cum.	550	342	0	42	166	0	2,932,834	164	13	20	131	891,482	....	....	....
Saskatchewan cum.	427	315	0	1	110	1	1,842,912	94	10	0	84	368,472	....	....	....
Manitoba cum.	95	65	0	0	28	2	209,382	21	0	0	21	57,651	....	....	....
B. C. cum.	38	4	0	16	18	0	200,711	23	4	5	14	128,707	....	....	....
N.W.T. cum.	3	0	0	0	3	0	9,565	3	0	0	3	9,565	....	....	....

*Incl. 16 cond. disc.: Okla. 2, Texas Dist. (2) 4, Texas Dist. (3) 2, Texas Dist. (4) 6, Texas Panhandle 2.

Note: Cond. totals are no longer included in oil totals. Service wells are no longer included in dry holes. The sum of crude, cond., gas, dry, and service = total wells.

... **Continental Oil Co. 1 Indian,** southwest offset to the field discovery well, is also a success.

... **Continental** completed 1 Navajo-H, an important link well between Aneth and East Aneth fields, for 192 bbl. of oil per day from Paradox perforations at 5,930-52 ft.

... **Shell Oil Co.** moved Paradox basin production to its westernmost point at 1 Tohonadla, 6 miles northwest of North Boundary Butte field and more than 20 miles west of easternmost production at Aneth proper. The well made 528 bbl. per day from upper Hermosa-Pennsylvanian at 4,995-5,050 ft.; at month's end the well was an indicated Paradox producer at 5,527-5,665 ft.

... **And in Colorado,** General Petroleum Corp. completed a Paradox gas discovery in La Plata County for 15,780 M.c.f. of gas per day. The F-11-32 Cater is 5 miles northwest of Red Mesa-Cretaceous gas field.

The Regional Scen

In Oklahoma . . . Woodward County in the northwestern part of the state has its second producing area as a result of Champlin Oil & Refining Co.'s completion at 1 McDonald near the city of Woodward. This important confirmation to the county's potentiali-

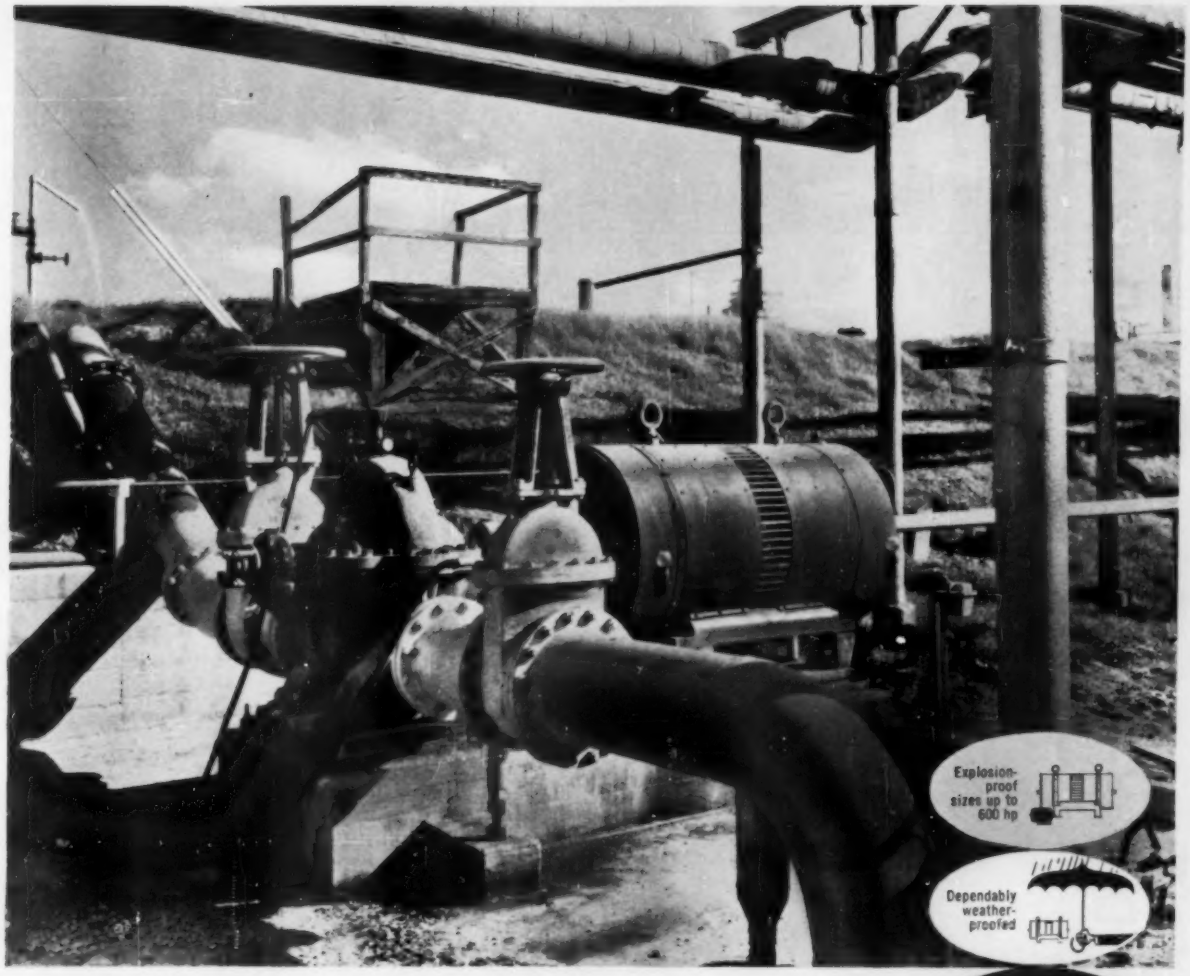
(Text continued on page 244)

(Tables continued on pages 240-42)

Breakdown of Field Wells Drilled in May 1957, by Depth

	Oil									Gas									Dry								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama							9																				
Arkansas	1	24	14	5	3															1	6	4	1				
California	28	38	34	26	20	7		3				2		1					4	5		2	1	1	1	1	
Colorado				2	2	3				2			1		1					1		3	5				
Illinois	8	39	42							2		1							7	15	76						
Indiana	8	12	2							5									14	11	1						
Kansas		20	92	29	3						2	10	4	5						15	52	33	9				
Kentucky	25	20	3							3	2	11	3						26	12	9	1					
West	25	20	2							1									26	10	9						
East			1							2	2	11	3							2		1					
Louisiana	3	39	11	13	22	46	32	8	1		2	2		2	5	8	14	2	3	3	10	5	5	11	18	12	1
North	3	37	9	5	6	2	1				1	2			1	1			1	3	10	3	2	1	2		
South		2	2	7	12	16	25	8	1		1			2	2	6	11	2	2			2	2	8	9	9	
Offshore				1	4	28	6								2	1	3						1	2	7	3	1
Mississippi					5	1	3															3	3	1		2	
Montana	1	2	5		6	5														4	3						
Nebraska					21																2		11				
West					21																2		11				
East																											
New Mexico	2	20	15	33	3	1	5				2	5	19	23	1				3	9	9	9	2		1		
Northern		6	1	1	9						2	5	17	22	1				2	3	1		1				
Southeast	2	14	14	32	4	1	5						2	1					1	6	8	9	1		1		
New York	17																		18								
North Dakota						11	1														1						
Ohio	13	4	34	1						3	3	8	2						6	12	8	3					
Oklahoma	15	74	87	40	35	20	2			3	1	1	1	13	2				18	44	42	12	17	3			
Pennsylvania														9									3				
Texas	78	257	322	232	176	101	23	9		1	17	12	6	17	8	1			35	104	52	54	52	23	4	1	
Dist. 1	18	23	14	1	1	2										1			3	4	2		1	1			
Dist. 2	2			8	9	9						2		3	2							1	6	2	1		
Dist. 3	7	3	9	8	17	23	9				1		1	2					2	3	5	4	10	13	1		
Dist. 4	3	2	13	9	18	12	1				3	5	1	4	3				1	2	1	5	9	4			
East		8	15	11	15	6								2	1				1		1	9	5				
Dist. 7-B		54	17	38	21						1		2						2	10	10	15	7				
West	7	44	147	107	68	42	12	9		1	3		1						1	8	14	9	12	2	2	1	
Dist. 9	41	116	30	49	22									6					21	75	15	11	2				
Dist. 10		7	77	1	5	7	1				9	5	1		2				4	2	4			1			
Utah					9																		1				
West Virginia		8									13	8	6							4	2	1					
Wyoming	2	11	10	5	9	2					1	2		3	2				4	3		3	5				
Michigan		3	8	1	1															7	6	1					
Total U. S.	201	571	679	387	325	197	75	20	1	19	43	62	42	73	19	9	14	2	134	249	284	132	116	39	24	16	1
Western Canada		11	13	85	27	7					2	1	3	2						6	6	9	3	1			
Alberta		3	9	17	27	7					2	1	2	1						1	4	3	2	1			
Saskatchewan			4	68																2	2	6					
Manatobia		8												1						3							
British Columbia													1										1				

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.



A dependable guard for petroleum outposts

Louis Allis explosion-proof motors need little attention

Once installed in your unattended locations, Louis Allis fan-cooled, explosion-proof motors can be virtually forgotten. They're designed to assure long, trouble-free service with a minimum of attention. That's why you'll find them in countless remote installations, like the above 450 hp pump-motor application at a large refinery in the Southwest.

These dependable motors incorporate insulation that resists heat, moisture, and corrosion. What's more, the sturdy completely-enclosed cast-iron housing is perfect protection against rough weather — shrugs off rain or sandstorms with equal ease, and ignores even the corrosive effect of saltwater spray.

Generous bearing sizes and ample provision for lubrication assure minimum maintenance attention and long, trouble-free bearing life.

You will like these motors for remote installations. Ask your Louis Allis District Office for Bulletin 800 — or for engineering assistance. Or write The Louis Allis Co., 449 E. Stewart Street, Milwaukee 1, Wis.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

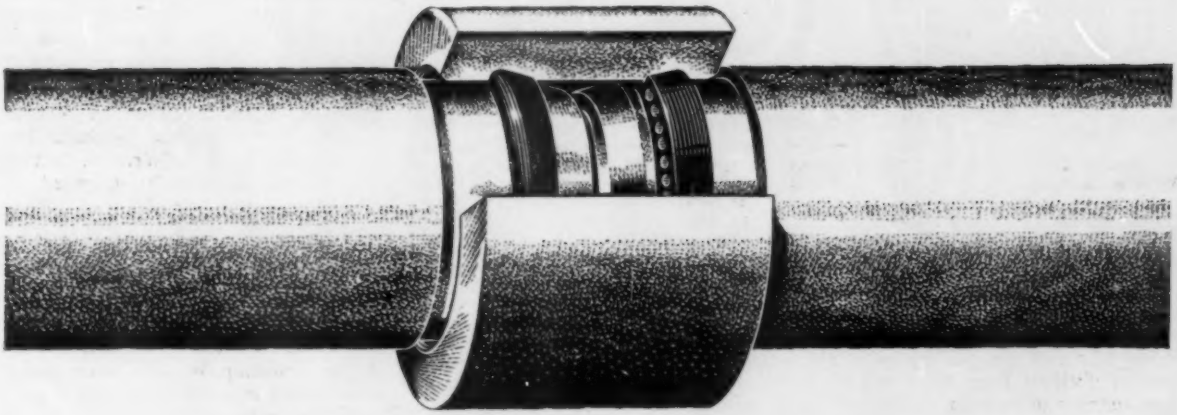
Breakdown of Wildcats Drilled in May 1957, by Depth

	Oil									Gas									Dry								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama																				1			1		1		
Arkansas			1	2									1						3	1	6	1					
California		1	1	1	1	2	2												7	6	5	5	12	5	2	3	
Colorado					1						1		3		1					1	2	8	21	4			
Florida																							1	1			
Illinois			2	1															13	34	14						
Indiana	1																		4	5	2						
Kansas		2	1	2							1		1	1					1	1	18	36	10				
Kentucky	2										1								10	5							
West	2										1								10	5							
East																											
Louisiana				1	1	1	2	1	1			1		1		5	3	1		1	6	1	1	6	18	4	3
North				1	1		1					1		1						1	5	1	1				
South							1		1							5	3	1			1			4	15	3	3
Offshore						1		1																2	3	1	
Michigan			3		1														2	5	2	2					
Mississippi							3														1	2	12	3	2	1	
Montana					1		1												2		3	6	3	1			
Nebraska					3															1	5	6	41				
West					3															1	4	6	41				
East																					1						
New Mexico			1		1		1							1					2	1	3	1	2	1	3		
Northeast														1									1		1		
Southwest			1		1		1												2	1	3	1	1	1	2		
New York												1															
North Dakota																					2	3	4	1	1		
Oklahoma		1			4	3	1						1		1				4	4	13	16	16	4		1	
Pennsylvania															2								1				
South Dakota																			1	1			2	1			
Texas	1	13	5	14	19	12	8	3	1		1	4	3	7	3	2			18	97	91	71	98	44	8	3	1
Dist. 1					1														7	6	13		3	1			1
Dist. 2				1	1	2	2					2		1							2	7	9	4			
Dist. 3						1	1	1				2	1		1						1	1	7	26	6		
Dist. 4				1	5	6	1				1	1	1		1	1			1	3	9	5	19	8	1		
East																					3	5	14				
Dist. 7-B	1	8	1	9	3							1		1					3	43	25	19	21	1			
West		1	1	1	4	2	4	2					1		1					10	12	23	21	8	1	3	
Dist. 9		4	3	2	3									5					7	35	26	9	4				
Dist. 10					2	1			1							1						2		1			
Utah						1								1						1	1		3	1			
West Virginia																						1	1				
Wyoming	1			1		1										1			3	2	1	5	8				
Total U. S.	5	17	14	22	32	20	18	4	2		4	6	9	11	7	8	3	1	70	167	175	164	237	72	35	12	4
Western Canada			1	2	1							2	2	1					4	8	12	14	10	5	5		
Alberta				1	1							2	2						1	2	2	2	5	2	5		
Saskatchewan			1																3	3	8	11	5	1			
Manitoba																				2	2						
British Columbia				1										1								1		2			
NWT																				1							

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,0

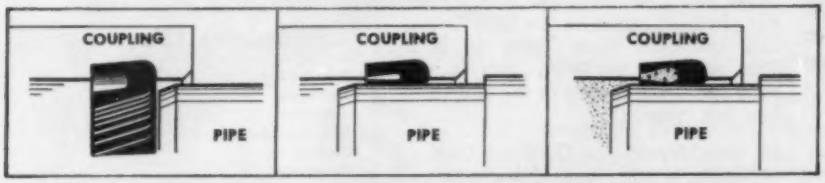
STANDARDIZE ON "Century" ASBESTOS-CEMENT PIPE BECAUSE IT'S EASIEST AND QUICKEST TO MAKE-UP...

just slide it together . . .



you have a tight seal that gets tighter as pressure increases!

HOW FLUID PRESSURE TIGHTENS THE SEAL. Pressure inside pipe forces fluid into sealing rings, causing expansion of seal against pipe and coupling. The greater the pressure, the tighter the seal.



Write today for Bulletin No. A-C 456 which contains complete specifications on Century Fluid-Tite Coupling and A-C Pipe. Your copy of A-C Pipe Flow Chart, hole punched for your notebook, sent free with each Bulletin.

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Phone: EDison 2-8871

HOUSTON 2, Texas
420 Esperson Building
Phone: FAirfax 3-1153

TULSA 3, Oklahoma
Hunt Building
Phone: CHerry 2-1284

MIDLAND, Texas
Box 345
Phone: MUtual 4-4926

Footage Breakdown for May 1957

	Fields			Wildcats		
	Oil	Gas	Dry	Oil	Gas	Dry
Alabama	103,413					19,937
Arkansas	136,186		45,459	10,979	4,520	27,589
California	533,630	13,000	65,759	55,838		250,855
Colorado	48,206	15,081	45,200	5,005	26,453	195,083
Florida						15,441
Illinois	206,288	3,956	234,468	9,896		117,274
Indiana	38,285	3,810	34,123	1,227		21,708
Kansas	472,433	79,278	389,545	15,975	11,408	276,056
Kentucky	56,377	53,880	66,972	1,704	1,985	19,787
West	53,808	1,170	58,530	1,704	1,985	19,787
East	2,569	52,710	8,442			
Louisiana	1,188,300	377,790	556,034	70,814	124,604	387,080
North	183,437	27,410	94,681	21,217	9,727	26,760
South	669,812	279,506	316,339	27,623	114,877	292,764
Offshore	335,051	70,874	145,014	21,974		67,556
Michigan	39,094		33,579	14,421		25,884
Mississippi	74,886		66,344	34,682		148,130
Montana	108,498		18,883	18,102		63,782
Nebraska	131,954		75,026	19,493		300,213
West	131,954		75,026	19,493		297,002
East						3,211
New Mexico	366,567	251,016	107,836	19,076	7,368	69,653
Northwest	66,706	234,929	13,703		7,368	15,408
Southeast	299,861	16,087	94,133	19,076		54,245
New York	17,000		18,000		3,483	
North Dakota	108,509		3,398			63,310
Ohio	129,283	41,037	63,617			
Oklahoma	994,915	117,971	403,899	64,448	14,360	259,153
Pennsylvania		66,546	19,195		15,442	5,775
South Dakota						22,776
Texas	4,944,145	279,898	1,198,734	459,718	115,328	1,912,629
Dist. 1	119,300	10,505	31,153	5,100		96,462
Dist. 2	166,781	41,292	67,104	51,087	12,240	130,742
Dist. 3	479,668	16,145	228,299	31,453	11,729	290,875
Dist. 4	308,870	75,984	119,006	97,813	29,374	252,554
East	299,067	21,769	91,430			114,557
Dist. 7-B	446,311	10,317	164,388	76,092	8,919	377,306
West	2,070,806	11,599	219,336	116,038	13,282	413,240
Dist. 9	694,326	36,341	249,257	43,806	29,625	219,483
Dist. 10	359,016	55,946	28,761	38,329	10,159	18,410
Utah	51,898		5,856	7,637	7,418	30,550
West Virginia	14,750	79,384	17,824			10,701
Wyoming	148,411	47,614	51,646	12,778	10,176	82,979
Total U. S.	9,913,028	1,430,261	3,521,397	821,793	342,545	4,326,345
Western Canada	661,111	32,780	95,116	17,000	23,123	270,297
Alberta	329,007	22,741	46,991	9,949	15,824	118,006
Saskatchewan	315,445		37,955	2,535		118,349
Manitoba	16,659		4,599			10,055
British Columbia		10,039	5,571	4,516	7,299	21,426
N. W. T.						2,461

ties as an oil and gas producer flowed 9,100 M.c.f. of gas per day with 365 bbl. of distillate from the lower Morrow-Pennsylvanian sand.

Sinclair Oil & Gas Co., et al confirmed Northwest Alden field in Caddo County by completing 1 Dyer as a first Bromide-Ordovician producer. This is the confirmation well to the famous 1 Susie, the 1956 exploratory newsmaker in southwestern Oklahoma.

Alfalfa County's Cherokee-Pennsylvanian campaign paid off with another promising discovery. Davon Drilling Co. et al opened a new pool in 18-27n-8w with a flow of 15,000 M.c.f. of wet gas daily. New Northeast Cherokee pool in the same county has eight producing oil wells.

In Colorado . . . Phillips Petroleum Co. was drilling below 15,658 ft. at 1 Mannel in the Powell Park area of Rio Blanco County in northwestern Coloradio to set a new state depth record.

In Wyoming . . . The Texas Co. recovered oil on test of the Pennsylvanian at the second deep well at Donkey Creek in the Powder River basin to confirm the apparent promise of pre-Cretaceous production in the northern part of this big basin.

In Galveston Bay . . . This bay's latest drilling spree netted a new field 3½ miles off the Chambers County, Texas shore in the upper part of the busy body of water on the Gulf Coast. Sun Oil Co.'s State Tract 88 is a Frio sand oil producer. This is the sixth new field opened in the bay since late last year.

In New Mexico . . . Tidewater Oil Co. 6 Coates, 4 miles east of Jal, offers a strong argument for further exploration and development in older areas of the Permian basin. The deep test found production in every zone below the regular Glorietta 4,700-ft. pay at Justice field. Oil flowed from the Clear Fork, the Tubb, the McKee, and the Ellenburger.

In California . . . L. A. Harnish completed E53-34F Allison flowing more than 1,000 bbl. of oil per day in a new Gatchell sand pool in Guijarral Hills field in Fresno County, touching off much-needed deeper drilling activity in the area.

In Montana . . . Amerada Petroleum Corp. 1 Ruegsegger, Sheridan County wildcat, found oil in the Silurian to become the county's third producer and the second to produce from Silurian. The well is in the Outlook area where production is found in both the Silurian and Ordovician.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

A deepening job in Marne pool resulted in a 300-bbl. producer for Waverly Oil Works. On 2 L. C. Giffen, Lot 6, Madison Township, Licking County, Clinton sand was logged at 2,600-23 ft. with 600 ft. oil natural.

- An offset extension to the new pool in Franklin Township, Wayne County, was completed by Smith Petroleum Co. on 2 L. Harrison, Section 15. Clinton at 3,603-70 ft. gaged 10 bbl. natural and 140 bbl. with 1,000,000 cu. ft. gas in 24 hours after fracture.
- A further extension to the old Wooster field gaged 100 bbl. in a 24-hour test after fracture. Frank Brendel Oil & Gas 1 Herman, Section 9, East Union Township, Wayne County, found the Clinton at 3,658-93 ft. with a good oil showing natural.

PENNSYLVANIA

In Unity Township, Westmoreland County, Southwest Pennsylvania, Felmont Oil Corp. 1 James H. Rodgers,

Exploration This Week

Appalachian	244
California	246
Canada	248
Illinois Basin	251
Kansas	253
Louisiana	254
Michigan	257
Nevada	258
Oklahoma	258
Oregon	262
Rocky Mountains	262
Texas	262
Washington	265

on the "scorpion"...

the Rotary Hose is

Thermoid

POWERFLEX

The patented full flow coupling at the left is just one reason why the Scorpion is equipped with Thermoid Powerflex Rotary Hose. It's an integral part of the cable assembly—cannot leak or pull off. The cable itself is made up of *33 miles of high tensile steel-wire* wrapped and counter wrapped. And the tube and cover of Powerflex Hose are made with oil and abrasion resistant Neoprene, reinforced with impregnated multi-ply woven fabric.

You'll also find Thermoid Suction and Discharge Hose and Thermoid Multi-V Belts "aboard" the Scorpion for the same reason—superior quality construction. Order Thermoid Oil Field Products from your nearest supply store or Thermoid warehouse.

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deep wildcat, elevation 1,733 ft., was dry, Tully 7,643 ft. Total depth 7,822 ft. Formations below the Tully were badly faulted.

WEST VIRGINIA

Licking District Test Is Large Gas Well

In Licking district, Tucker County, West Virginia, Hope Natural Gas Co. 10017 Thaddeus Pritt wildcat, elevation 2,256 ft., resulted in a large gas well in the Oriskany sand after fracture. It gaged 13,732,000 cu. ft., with a rock pressure of 2,070 psi. in 48 hours. Tully 4,098-4,120 ft., Oriskany sand 4,580 ft., finishing in the Helderberg at a total depth of 4,738 ft.

CALIFORNIA

Tepusquet Discovery Near

Sunray Mid-Continent Oil Co. was reportedly nearing a new field discovery with a 4,824-ft. wildcat, 1 Sisquoc Ranch, in NE SE 19-9n-31w. This is in the Tepusquet region about 5 miles northeast of Gato Ridge production and 3¾ miles northeast of three wells in the Foxen Ridge area of Santa Barbara County. Sunray was running 3½-in. tubing to complete the test. The operator also announced a new wildcat location in 36-9n-31w, about 5 miles southeast of 1 Sisquoc.

Trice Gas Field Extension Planned

Ajax Oil & Development Co. has staked location for a wildcat in NE NE 11-24s-23e to test the upper and lower Stevens and Vedder. The well, 81-11 Ajax-Phyllis, is located 3 miles east of Trico gas field in Tulare County and about 20 miles north of Wasco oil field in Kern County.

Roberts Gas Field Extension Successful

Arcady Oil Co. completed a wildcat, 2-10 Holt, in NW SE 10-1n-5e as a successful extension of the Roberts Island gas field in San Joaquin County. Arcady's new gasser is almost midway between Whiskey Slough gas field and Roberts Island. It is 1¾ miles north of Roberts Island where several weeks ago Standard Oil Co. of California completed an extension test almost 1 mile south of the field.

The Arcady well flowed 1,900 M.c.f. daily rate of a test through a 12/64-in. choke from an interval at 5,263-71 ft. Total depth is 5,350 ft.

Big Fillmore Well

Humble Oil & Refining Co. completed another good well in Fillmore field, Ventura County. This newest completion, 3 Eddie Perkins, was brought in flowing 475 bbl. daily from 13,880-13,963 ft. through a ¼-in. choke. It is located on the north edge of production.

LUXURY LIVING . . .

on a PIPE LINE . . .

Modern, attractively designed STURDYBILT Prefabricated Houses bring luxurious living to families who must live on the job.

Give your workers modern STURDYBILT Houses and they'll hate to move. One to four bedroom houses are available in a great variety of exterior designs in keeping with modern building trends.

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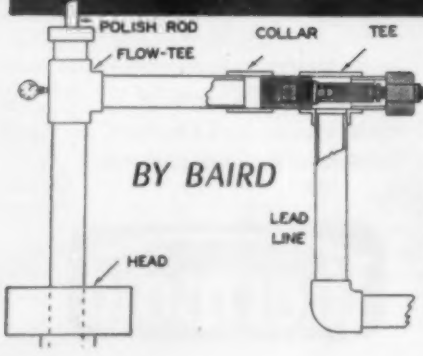
STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

BACK-PRESSURE REGULATOR

"Wherever there's oil you'll find Baird products on the job."



Keeps pressure on tubing strings.

For wells that head up and flow, back pressure on the tubing tends to keep the tubing full which prevents stuffing box trouble and increases pump efficiency. By maintaining a back pressure on the tubing, this regulator keeps gas from breaking out of the solution and thus helps to prevent paraffin formation.

ALWAYS AVAILABLE THROUGH YOUR SUPPLY STORE

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Built for Men Who Know

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WICHTEX
Well Servicing Units

Wichtex units are designed for fast, simple, efficient operation, tremendous roadability, and low upkeep . . . and are famous for long life without major repair or depreciation. Models range from 2,000 to 12,000-foot capacity. All models can be equipped with spudding attachment.

Investigate Wichtex Well Servicing Units . . . also, Wichtex Portable Rotary Rigs from 2,000 to 5,000-foot drilling.

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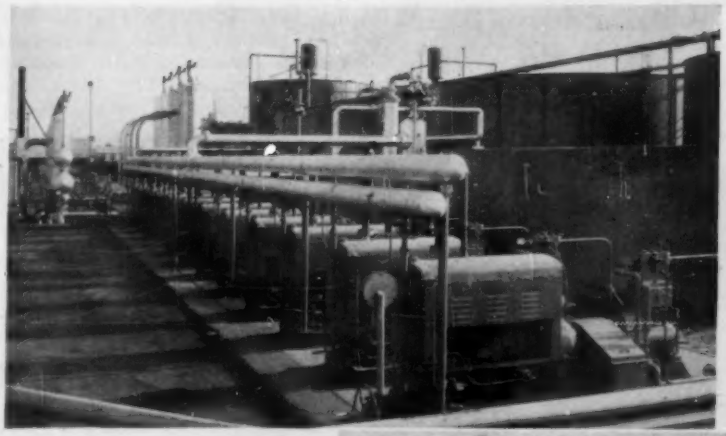
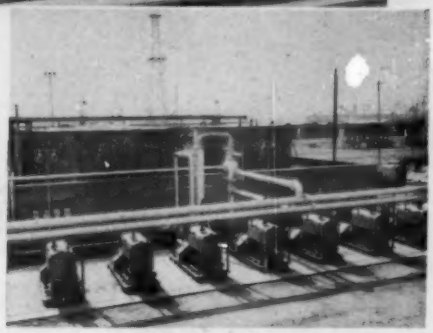
WEST COAST OIL CO. PURCHASES SECOND VAPOR PHASE® SYSTEM



Efficiency and Economy of Operation So Successful Eight More Engines to be Vapor Phased



So pleased with the performance of its first Vapor Phase system, installed in 1951, this well-known oil company is now installing a second system to service eight additional engines.

Shown above is the original installation of twelve 45 bhp Minneapolis-Moline engines, all operating on the single Vapor Phase separator seen in the center.

This single unit utilizes the steam output of all twelve engines for power oil heating.

Want more information on how Vapor Phasing can improve the performance, and cut the operating costs of *your* installation?

Write or call for recommendations and estimates. No obligation.

"Sole Developers and Manufacturers of Vapor Phase Thermal Circulation (Ebullition) Engine Cooling."

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CANADA

ALBERTA

Richfield Announces Two Alberta Discoveries

Richfield Oil Corp. has two indicated wildcat discoveries in Alberta—one in the Gilby-Bentley oil area of central-west Alberta; the other in the Bellshill Lake area of central-east Alberta. Both are indicated discoveries in the basal quartz member of the Blairmore formation.

Gabriel Lake . . . The best of the two wells on the basis of drill-stem tests is the 7-29 Gabriel Lake on LSD 7, 29-40-3w5, about 2 miles south of Viking oil wells at West Gilby field and 5 miles north of Richfield's and Hudson's Bay's 7-32 Medicine River discovery which was both an oil producer in the basal quartz and the Mississippian.

During drill-stem tests in the basal quartz, oil flowed to surface. On the third test recovery of free oil and oil and gas-cut mud was reported. The three tests covered a 52-ft. section, and were run below 7,008 ft.

A total of 26 wells have been drilled within a radius of 8 miles of Richfield's new strike. Sixteen of these, including wells at Gilby and West Gilby, are Viking oil producers, another Viking discovery lies 5 miles southeast and gas completions are located 2 and 5½ miles southeast. Three of the remaining wells in this immediate locale have been suspended after indicating oil or gas production. One of these is a Cardium oil discovery while the other two are suspended in the Viking sand. The other three holes are all plugged and abandoned.

Schultz Lake . . . The other Richfield discovery is the 10-10 Schultz Lake, LSD 10, 10-41-12w4, 3 miles south of Bellshill Lake oil field in central-east Alberta.

The operator set production casing and ran initial tests after finding oil on drill-stem test. The tests were inconclusive, however, as fluid recovery was 75 per cent salt water. The operator squeezed off that set of perforations and is now testing lower perforations.

SASKATCHEWAN

Two Saskatchewan Wildcats Indicated Discoveries

Two wells in Saskatchewan, one in the far southeastern corner and one in the southwestern part of the province, were indicated oil or gas discoveries.

One of the wells indicating success was drilled by Whitehall Canadian Oils, Ltd., near Glen Ewen, just west of the Manitoba border. It is a Charles-Mississippian discovery; the other wildcat, drilled by Canadian Seaboard Oil Co. near Fusilier, 10 miles east of the Alberta border, flowed gas from the detrital zone.

Whitehall . . . The 1-9 Glen Ewen well, LSD 1, 9-3-1w2, recovered 4,250 ft. of oil on drill-stem tests of the Charles.

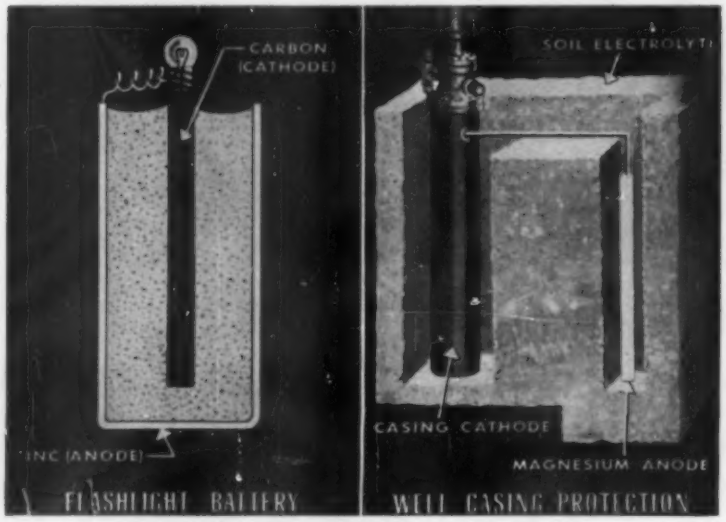
Fusilier . . . The 7-1 Fusilier discovery, LSD 7, 1-33-27w3, flowed 2,500 M.c.f. of gas per day from the detrital zone.

Oil Shows Found in Devonian at Fusilier

Canadian Seaboard Oil Co. tapped the Devonian at southwestern Saskatchewan wildcat, recovering a small amount of oil. The presence of oil and porosity in this formation is the second time a well has ever found Devonian shows in Saskatchewan.

The well, 7-1 Fusilier, LSD 7, 1-33-27w3, found gas production in the detrital at 2,500 M.c.f. per day. The Devonian test found 10 ft. of dark brown oil plus 70 ft. of slightly gassy oil-cut mud duriing drill-stem test.

The Fusilier discovery is in the general Coleville-Smiley area where Banff and Viking oil successes have proved up one of the province's major producing areas. Devonian oil production



HOW NATURE'S BATTERY PROTECTS WELL CASING

In an ordinary flashlight battery current flows from the zinc case (anode) through an electrolyte to the carbon rod (cathode). The zinc anode is corroded away.

You can protect the casing in your oil and gas wells from external corrosion by completing nature's battery. Add a magnesium anode bed and let the well casing be the cathode. The soil between the two acts as the electrolyte.

CSI engineers—pioneers in the field—have protected hundreds of wells in this way: They first survey the wells, using special surface instruments designed by CSI. Polarization curves are plotted to determine the current required for cathodic protection. Then magnesium anodes are installed. Protection designed for 10 years has averaged about $350 per well.

CSI offers expert engineering and installation services—plus a complete line of Dow magnesium anodes and other brand-name cathodic protection supplies at competitive prices. Call or write today. Estimates or quotations without obligation.

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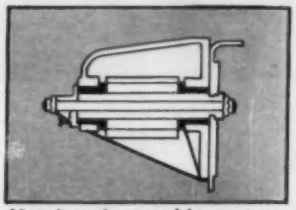
Renewable bushings at 128 key wear points stretch AUTOCAR'S profitable operating life

"We'll haul anything anywhere and at any time," says Spell Bros., of Crowley, La., "but the discovery of oil in our area has led us into specializing in oil field hauling. Here we are winching heavy oil field equipment from one Autocar over onto 'the biggest thing on wheels,' our Autocar DC20364 6-Wheeler."

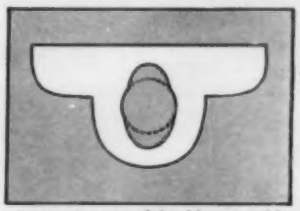
The use of bushings permits the Autocar owner to confine normal wear to low-cost, easily replaced parts instead of larger and expensive components.

Moreover, Autocar specifies bushings of different materials to meet different conditions. Parts subject to high-speed operation, such as connecting rods, camshafts and gears, employ soft metal bushings to prevent scoring the more costly mating parts. On the other hand, where limited motion and shock or impact are primary considerations, bushings of carburized, hardened steels are used.

No other truck can show as complete an application of carefully engineered bushings as Autocar. They are one of the quality features that give Autocars their outstanding superiority under all kinds of operating conditions. If you are interested in a vehicle that delivers new-truck performance and maintenance economy long after other trucks have ceased to be profitable, get in touch with your White-Autocar distributor.



Note how the use of low-cost, replaceable bushings protects a much more expensive assembly.



Autocar's use of bushings avoids wear like this—a whole part must be replaced at considerable cost.

White Autocar

AUTOCAR TRUCKS

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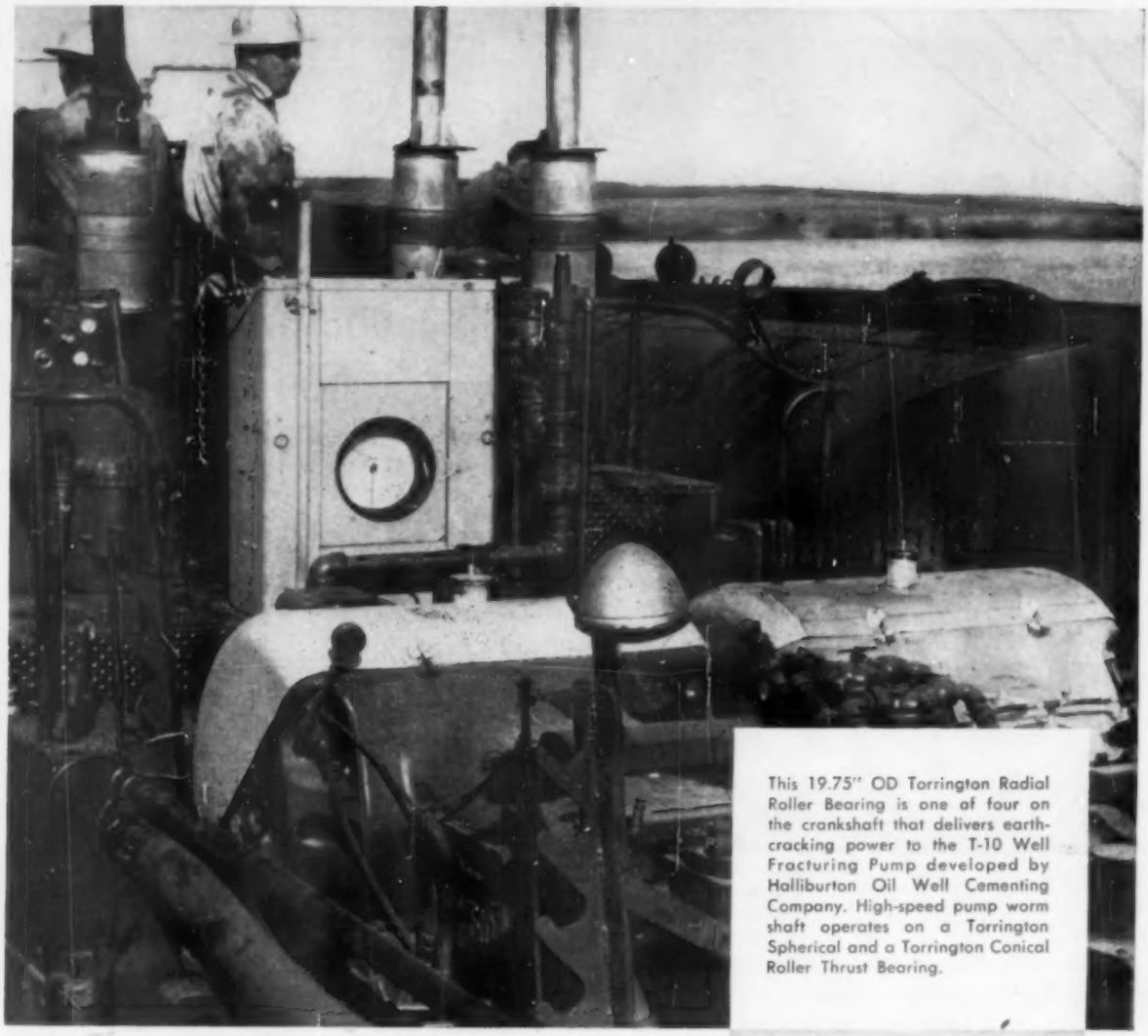

This 19.75" OD Torrington Radial Roller Bearing is one of four on the crankshaft that delivers earth-cracking power to the T-10 Well Fracturing Pump developed by Halliburton Oil Well Cementing Company. High-speed pump worm shaft operates on a Torrington Spherical and a Torrington Conical Roller Thrust Bearing.

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Pressure is applied through a Halliburton T-10 Well Fracturing Pump. Mounted on the crankshaft of this pump are four Torrington Radial Roller Bearings. There they render dependable service and meet the demanding requirements of severe space and weight limitations.

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lies 60 miles west in the Youngstown area of Alberta.

Mission Canyon Discovery Hinted in Southeast

The team of Canadian Oil Companies, Ltd., and Devon Palmer Oils, Ltd., found oil in the Mission Canyon-Mississippian at the 1-7 North Browning on LSD 1, 7-7-5w2, 8 miles north of the recently consolidated Steelman field, and 53 miles east of Weyburn town. This is the eighth well to be drilled by the team in an 18-well drilling program, and is the first discovery out of eight wells drilled. Ten tests have been spudded—of these seven were abandoned, two are drilling, and the rig on the Browning discovery will move in on the eleventh well.

QUEBEC

Batiscan Gas Development Report

At Bald Mountain 1 Louiseville, 38 miles southwest of the discovery well, on Saturday, June 8, in the Beekmantown formation, the drill cored into a gas zone at 819 ft., which earlier tested 847,000 cu. ft. per day, from a 2-in. hole and with a closed-in pressure repeatedly rising to 400 lb. in 2 minutes. The well is being conditioned to drill in and through this gas, and the Beekmantown formation is believed to underlie the Batiscan area at about 2,500-2,600 ft.

This well was diamond drilled for stratigraphic information and a conventional oil well drilling rig will be brought to the area in about 3 weeks.

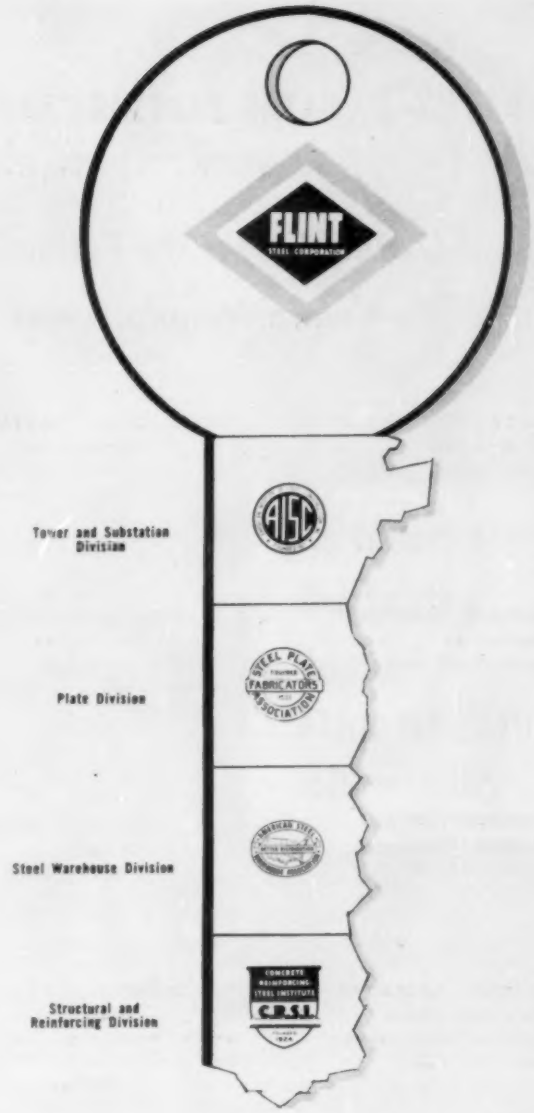
- At Bald Mountain 2 Batiscan, 1,250 ft. southeast of the discovery well, the hole is down to 2,473 ft., the 5½-in. casing has arrived and will be run and set.
- At Bald Mountain 3 Batiscan, ½ mile northwest of the discovery well, 8⅝-in. casing was run and set at 310 ft., and drilling is presently proceeding below 685 ft.
- At Bald Mountain 1 Berthier, 58 miles southwest of the discovery well, the well is down to 2,543 ft.

ILLINOIS BASIN

ILLINOIS

New Pay Found at Wabash County Test

A new pay, the lower Cypress sand at 2,624-34 ft., was reported at E. H. Morris 2 H. C. Bosecker in SW NW SE 11-2s-14w, 2 miles southwest of Bellmont, Wabash County. The well



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was completed on pump for 118 bbl. per day.

Williamson County Test Flows Aux Vases Oil

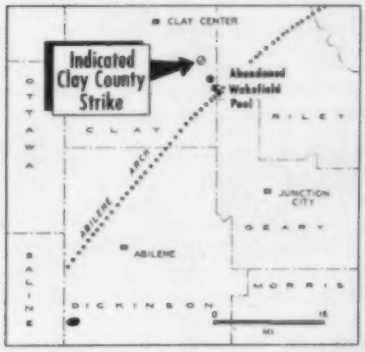
Ross Bartmes 1 H. H. Roberts et al, SE SE SW 21-8s-4e, 2 mile stepout wildcat in Williamson County, swabbed oil at the hourly rate of 3 bbl., natural, from Aux Vases sand at 2,886-92 and 2,896-2,907 ft. This discovery is 8 miles northeast of Marion.

WESTERN KENTUCKY

Hopkins County Discovery Completed in McClosky

An upper McClosky lime oil discovery was completed in a rank wildcat area 2 miles south of Mortons Gap in Hopkins County, 15-I-25. The well is Strouder Drilling Co. 1 Lucian C. Davis. It pumped 109 bbl. of oil and 14 bbl. of water per day, natural, from 2,155-69 ft.

KANSAS



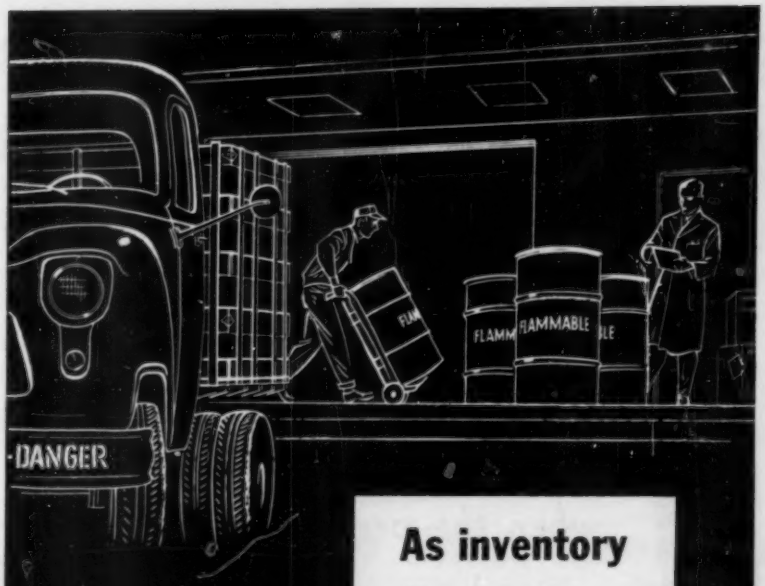
An indicated southeastern Clay County discovery in northeastern Kansas may reopen production in that county. It is Pure Oil Co.'s 1 Griffiths that could do the trick.

ABILENE ARCH

Revival of Clay County Production Possible

An indicated discovery in Clay County, 2 miles north of abandoned Wakefield pool and 6 miles northeast of the town of Wakefield, recovered 120 ft. of oil and heavily oil-cut mud on drill-stem test at 1,915-48 ft. in the Mississippian. The well, Pure Oil Co. 1 Griffiths, C NE NW 3-9s-4e, is on the Abilene arch which separates the vast untested Salina and Forest City basins. Pure has set 5-in. casing in the wildcat hole.

Activity in this portion of Kansas appears to be picking up. The Salina and Forest City basins are two of the last few remaining practically untested



As inventory fluctuates . . . does FIRE HAZARD follow suit?

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basins in the Mid-Continent province. Most of the Salina basin's production is at the far southern end, while Forest City basin production is limited to the extreme southeast corner of Nebraska, and in the Kansas City area.

Rank wildcat . . . West of Clay County in north-central basin, and just about in the middle of the Salina basin, Murfin Drilling Co. is moving in rotary tools at a rank wildcat in Mitchell County, 13 miles southwest of the town of Beloit. Location is in the south-central part of the county in NW NW NE 8-9s-8w. Nearest production is 40 miles southwest at Hall-Gurney field in Russell County on the Central Kansas uplift.

SOUTHWEST

Mississippian Discovery Completed in Ness County

Ness County has a new Mississippian producing area at Barnett Oil Co. 1 Rothweiler in NW NW SW 3-19-31, 2½ miles southeast of the town of Bazine and 1½ miles southwest of Ryersee field.

The well made 30 bbl. of oil daily on pump from open hole at 4,270-75 ft.

when the pressure is on . . .

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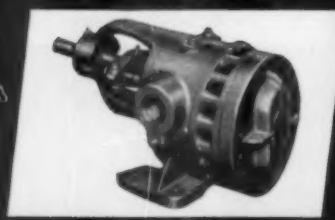
Gathering Lines HIGH PRESSURE



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Mississippian Discovery Finaled in Comanche

Pure Oil Co. 1 Tuttle "B" is a new Mississippian discovery 3½ miles south of East Snake Creek field in Comanche County.

The well flowed 2,000 M.c.f. of gas per day from perforations at 5,538-43 ft. Location is in C SW SW 6-35-20.

NORTHWEST

Cambridge Arch Area Adds New Oil Prospect

An indicated wildcat discovery, 4 miles south of the town of Traer in Decatur County recovered 180 ft. of free oil and 30 ft. of oil-cut mud on drill-stem test of the Lansing-Pennsylvanian at 3,938-55 ft. The wildcat is Jones, Shelburne & Farmer 1 Jording, SW SW SW 14-2s-30w. Operator has set casing.

LOUISIANA

NORTH LOUISIANA

May Discovery Report Shows Five New Strikes

Three new gas fields and two new oil fields were opened in North Louisiana during the month of May.

Bossier Parish . . . Gulf Oil Corp. 1 Haynesville Mercantile Co., 8-18n-13w, is a new Pettet oil discovery 2 miles north of Bossier City. The well flowed 72 bbl. of oil daily on 9/64-in. choke from lower Pettet perforations at 5,651-56 ft. The new producing area has been tagged Vanceville field. A confirmation well, the No. 2, is drilling 1,842 ft. northeast of 9-18n-13w.

Union Parish . . . Union Producing Co. 1 Odom, 4-21n-3w, is the discovery well of new Mt. Olive field, 1 mile northwest of Bernice and 3¼ miles northeast of Bull Creek field. The well flowed 304 bbl. of oil and 975 M.c.f. of gas per day on 12/64-in. choke from perforations in the Smackover at 10,294-10,300 ft. This is one of the most important wildcat happenings in North Louisiana this year.

Caddo Parish . . . Bassett & Akin 1 Keoun et al, 9-22n-14w, 4½ miles southeast of Mira and 7½ miles west of Plain Dealing in Caddo Parish, is a Paluxy gas-condensate discovery. The discovery well flowed 5,280 M.c.f. of gas per day plus 72 bbl. condensate on 24/64-in. choke from perforations at 2,833-37 ft.

DeSoto Parish . . . Sabine Pipe & Supply Co. 1 Maud N. Scott, 9-14n-13w,

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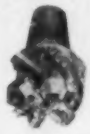

Type 155 Speedmill

Type 156 Speedmill

Type 150 Speedmill

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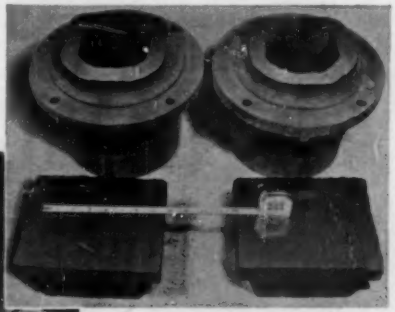
Colmonoy No. 1 electrodes have a new metallic coating that improves arc stability, permits vertical welding, and eliminates weld cleaning between successive passes. This reduces welding time to cut the already low cost of reclaiming valves with Colmonoy hard-facing.

Photo courtesy of Texas Alloy Products Co.



Two 8 inch slides and throats after being reclaimed with Colmonoy No. 1 (shown finish ground)

A valve slide being hard-faced with Colmonoy No. 1 electrodes.

Write for Colmonoy Hard-Facing Manual #79 for more about Colmonoy hard-facing alloys and methods.

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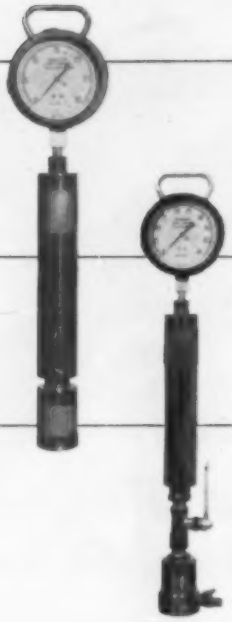

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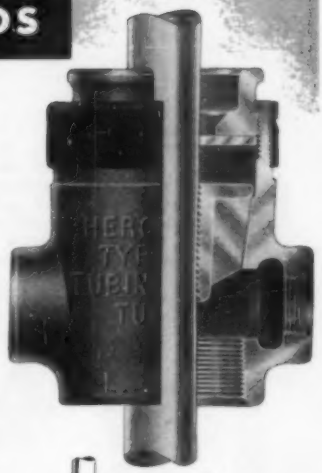
The dual purpose "Type J-5-S" Stripper Tubing Head is basically a "Type J-5" Tubing Head with a bowl (top section) screwed into the packing nut thread. The hinged slips, packing and packing nut are installed in the bowl (top section) with the tubing stripper in the body (lower section), thus permitting tubing to be run-in or removed under pressure. Test pressure is the same as the "Type J-5" Tubing Head.



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2⅛ miles north of Kingston, is the discovery well of Kingston field. The gas well flowed absolute open flow 5,400 M.c.f. per day and .251 bbl. condensate per million. Perforations in the Rushing zone of the Pettet were at 6,214-25 ft.

Webster Parish . . . The most important strike in North Louisiana in some time is Pan American Petroleum Corp. 1 A. A. Hudson, 4½ miles east of Minden on the flank of Minden salt dome. This well flowed 9,000 M.c.f. of gas per day and 13 bbl. of condensate per million from perforations in the Paluxy at 7,460-66 ft.

SOUTH LOUISIANA

Southeast Houma Field Production Confirmed

The confirmation well to Southeast Houma field in Terrebonne Parish was completed by Tidewater Oil Co. Final gage at the 1 Ruby J. Thibodeaux was 5,900 M.c.f. of gas per day on 16/64-in. choke. Perforations were in the field pay at 11,621-32 ft. Location is northwest of the field discovery well in 105-17s-17e.

Deer Island Discovery Completed in Terrebonne

The Texas Co. has a new gas area in Terrebonne Parish. The wildcat, 2¾ miles east of Deer Island field and 3 miles northwest of Bayou Penchant area production, flowed 1,963 M.c.f. of gas per day on ¼-in. opening from perforations at 8,132-36 ft. The well is the E-1 Continental Land & Fur Co. in 29-18s-13e.

Weeks Island Moves Into St. Mary Parish

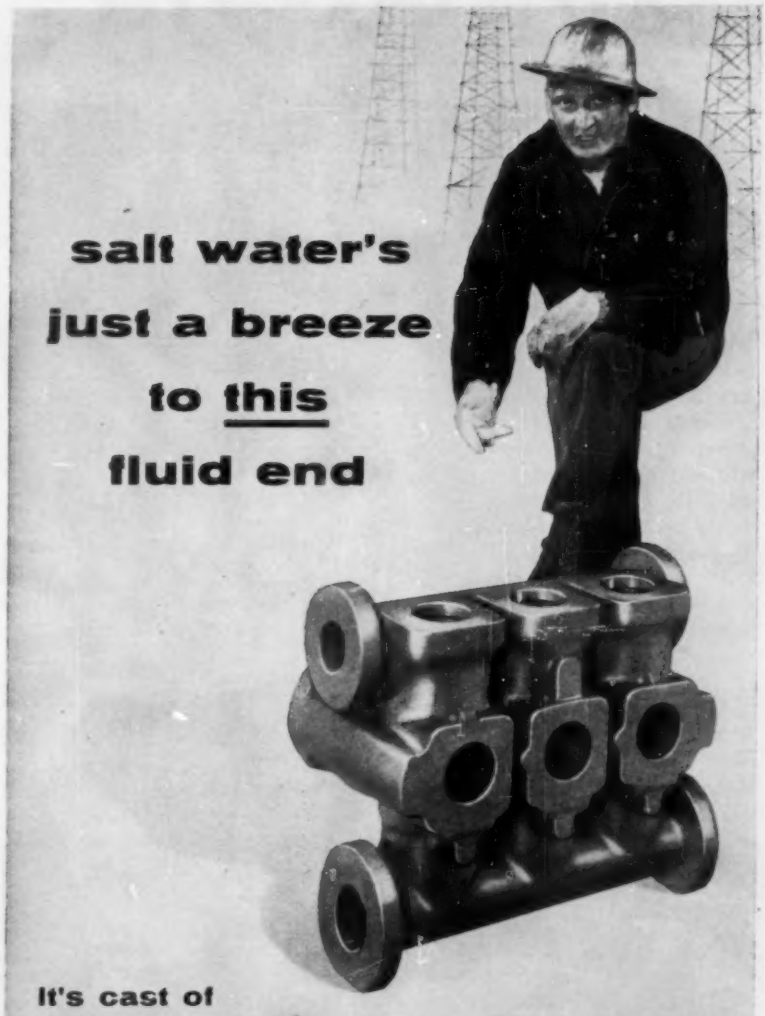
Prolific and ultra-deep Weeks Island field has been extended into St. Mary Parish by Shell Oil Co. The 1 J. M. Burgieres, Ltd., 4-14s-7e, is a gas producer at 16,126-37 ft.

The well made 181 bbl. of distillate and 4,076 M.c.f. of gas per day on 12/64-in. choke. Location is 1 mile southwest of current production at Weeks Island, one of the deepest producing areas in the world.

MICHIGAN

Deeper Pay Logged At Oceana Wildcat

A deeper and more prolific oil pay appeared to have been logged at the Swan-King Oil Co. and W. L. (Bill) Harvey 1 Skidmore, SW NE NE 15-



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16n-15w, Crystal Township wildcat, Oceana County. Well was deepened from Dundee to Reed City zone pay level and bottomed out for test and completion at 2,587 ft. Nine feet of Reed City zone oil pay were drilled between 2,578 ft. and the total depth. Well filled at the rate of 100 ft., or more, per hour with oil, no water showing. After tubing was run and disk was broken well flowed 17 bbl. of oil in about 3 to 4 hours and then died. First hour well flowed 5 bbl. of oil to tanks. The 1 Skidmore will be acidized within the week following extensive swab-flow testing.

Previously, a commercial or near-commercial gas and oil pay section was drilled in the Dundee. Well showed a good head of gas and an oil spray from Dundee pay logged between 2,498-2,514 ft. Dundee top was picked at 2,496 ft. This zone was cased and cemented off with 5-in. set at 2,564 ft.

● First deeper horizon oil pay logged to date in the Walker Traverse field area, Georgetown Township, Ottawa County, was being acidized at Fisher-McCall Oil & Gas, Inc. 2 Mackus, SE NE NW 2-6n-12w, a Traverse producer drilled approximately 400 ft. below top of Traverse lime. Well appeared to be good for about 15 bbl. of oil a day natural from this new dolomite pay drilled between 2,132-44 ft. Tubing was being set on a packer in preparation for acid treatment. Whether this new pay was in the lower Traverse, Dundee or Detroit River, had not been definitely determined. Some believed that it was lower Traverse. Others analyzed it as being Detroit River dolomite comparable with the middle or lower Detroit River oil pay zone that developed earlier in the Dorr pool, Allegan County.

NEVADA

Cal-Standard Grading Location for Wildcat

Standard Oil Co. of California was grading the location for 1 County Line Unit, a wildcat located on the border of White Pine and Nye counties in NW NW 19-10n-62e. Drilling was expected to get under way about the middle of June.

OKLAHOMA

SOUTHWEST

Deep Caddo County Wildcat Hits 17,000 Ft.

Magnolia Petroleum Co.'s ultra deep geological wildcat in Caddo County's Cement field passed the 17,000-ft. mark

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Part of the story is, of course, the ability of electronics to handle this complex mass of data accurately and swiftly. But an important reason why *so many companies are turning to IBM* is the extreme versatility of available equipment. For example, a large midwest oil producer installed an IBM 650 for payroll and accounting. And *within one month,* it was using the 650 for lengthy engineering calculations. In fact, this engineering work now takes a major share of machine time.

For more facts, just call your local IBM representative, or write: PETROLEUM DEPARTMENT A57, International Business Machines Corporation, 590 Madison Avenue, New York 22, New York.

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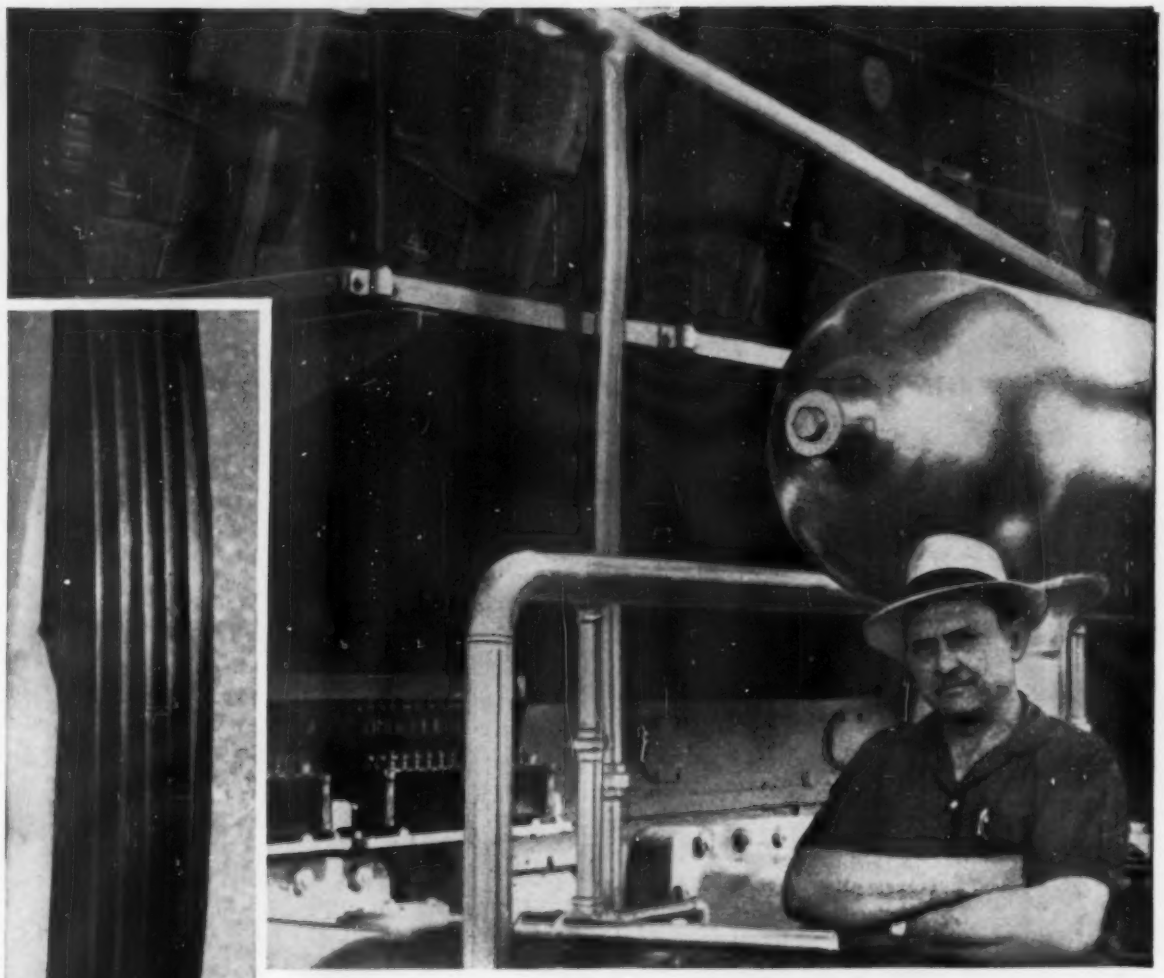

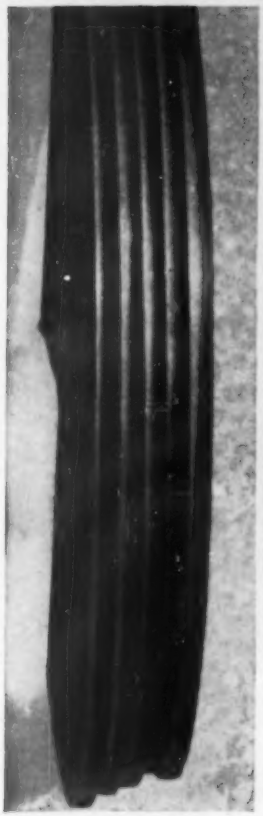

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Pedrick PISTON RINGS

The Michigan-Wisconsin Pipe Line Co. is another user of Pedrick Engineered Sets of piston rings to prove this. E3905 Sets are installed in Cooper-Bessemer GMW-10 natural-gas engines at the Edgar G. Hill compressor station at Guymon, Okla. Harry Crouch, superintendent, stands beside one of these engines in the picture above. The picture to the left is from an unretouched photo of five of the taper-face compression rings recently removed from the engine during routine maintenance. The bright surface is the area of wear. Note that it does not go even half way across the face of the rings after 27,000 hours of steady round-the-clock operation at full load! That's less than .0025 in. radial wear. The Pedrick *conformable* Formflex oil rings in this installation showed equally low wear. The rings still are in condition to give more than double the length of service already achieved! If you want to be more sure of minimum wear of rings and cylinder liners, if you would like to cut your lube-oil consumption to the bone, if dependability of performance under full load without interruption is important to you, then use Pedrick Engineered Sets of piston rings in your engines from now on.

WILKENING MANUFACTURING CO., Philadelphia 42 and Toronto 2

on its way to a projected 18,000-ft. depth. The 1 Sterba-Ordovician, SW NE SW 35-6n-10w, is drilling below 17,012 ft. in sand and shale.

Another well in the field is working below 6,015 ft. on its way down to deep Ordovician rocks. It is Pan American Petroleum Corp. 1 Cement-Williams, C NW NW 1-5n-9w.

NORTHWEST

Stockholm Area Picks Up Another Good Well

Pure Oil Co. 2 Palmer in C NW NE 29-26n-23w, Southeast Stockholm field, Harper County, flowed 130 bbl. of oil in 8 hours on 28/64-in choke from Tonkawa-Penn sand perforations at 5,496-5,502 ft. This is one of the best wells in this recently opened area which shows considerable promise as a prolific Pennsylvanian producing area. Location is east of the Laverne district.

SOUTH

Ardmore Geological Society Field Conference

The Ardmore Geological Society will sponsor a 2-day field trip in Carter and Love counties, Oklahoma, on September 13 and 14.

On the first day, Friday, the trip will be conducted by Dr. Hugh E. Hunter and Dr. Edward A. Frederickson. It will concern the pre-Pennsylvanian structure and rock sequence in the Criner Hills.

On the second day, the trip will be conducted by Dr. Frederickson, who will familiarize the field party with the Pennsylvanian rock sequence in the Criner Hills-Lake Murray area.

Dr. Frederickson and Dr. Hunter have made a study of the geology of the Criner Hills area in conjunction with their work as leaders of the summer field course of the University of Oklahoma School of Geology in that area.

Registration will take place and guidebooks will be issued at the Lake Murray Lodge, headquarters for the field trip, on Thursday, September 12, followed by a smorgasbord banquet in the ballroom of the lodge. Following the banquet, Robert C. Lang, III, Chief Geologist of Samedan Oil Corp., will give an illustrated talk on the theme of the conference, "Geologic History as Shown in the Criner Hills."

Advance registration will be honored prior to September 3. Registration forms and additional information may

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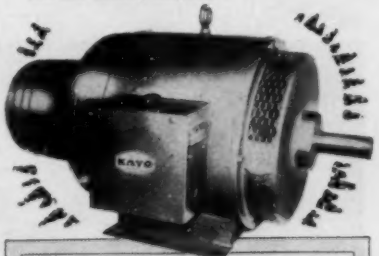

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be obtained by writing R. B. Harrington, Ohio Oil Co., Box 1099, Ardmore, Okla.

OREGON

G.P. to Begin Douglas County Wildcat

Drilling is expected to start within a week on General Petroleum's first wildcat well in Oregon. The well, to be known as 1 Long-Bell, will be drilled on property of the Long-Bell Lumber Co. in Douglas County, Oregon, 15 miles inland from the coast and about 12 miles northeast of Reedsport.

The drilling contractor, Green & Heiser Drilling Co., is expected to move in with heavy equipment for a deep test soon.

General Petroleum's wildcat is some 25 miles south of where Sinclair Oil Co. last year drilled a deep test hole.

The description of the location is 27-20s-10w.

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Condon Area Drilling Report

Standard Oil Co. of California was drilling ahead at 8,143 ft. on 1 Kirkpatrick in the Condon region of Gilliam County.

ROCKY MOUNTAIN

Shell Oil Co. recovered oil from the Red River-Ordovician at a South Dakota wildcat, 1 mile west of the state's first oil field, Buffalo.

SOUTH DAKOTA

Shell Has Indicated Red River Discovery

The first wildcat news in South Dakota in some time came out of the northwestern corner of that Williston basin state. Shell Oil Co. recovered oil on a drill-stem test of the Red River-Ordovician at 32-17 Graves, SW NE 17-21n-4e, Harding County. The wildcat, 1 mile west of Buffalo field, the state's only Williston producing area, and one of the two fields in the state, got 19.9 bbl. of oil and 3.9 bbl. of oil and water-cut mud and about 1 bbl. of mud and oil-cut water in 2 hours on test at 8,607-69 ft.

A core at 8,610-28 ft. recovered largely dolomite with pin point to some vugular porosity with oil stain. There were other shows below that depth. The drill-stem tests run at this wildcat appear to be better than the ones run at the discovery well in Buffalo field.

Buffalo field, opened 3 years ago, was the state's first discovery. It now has 2 wells making about 100 bbl. per day combined.

TEXAS

WEST TEXAS

Dry on Bottom, Wildcat Has Big Flow from Higher Pay

As West Texas operators run out of white spaces on the maps, they re-

Why Rib-Tops are *first* in the oil fields of the world

The four engineering developments shown at the right have made Rib-Top first choice for mud pump operation with drillers around the world.

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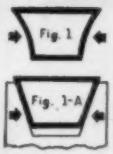
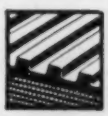
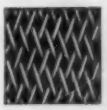
1. **Tougher, more resilient cords** are able to absorb the severe pulsations of mud pumps; easily handle peak loads.



2. **Concave Sidewalls** (U.S. Pat. 1813698) Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.



3. **Stabilizing ribbed tops** (U. S. Pat. No. 2548135) are exclusive with Gates. They dampen vibration, protect top of belt from damage, keep belt running smoothly over idler-equipped mud pump drives with no side whip.



4. **Flex-Weave Cover** (U. S. Pat. 2519590) A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

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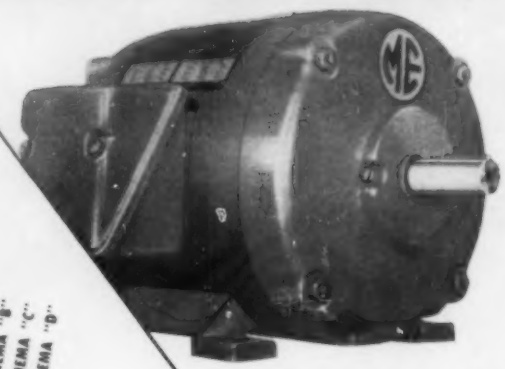

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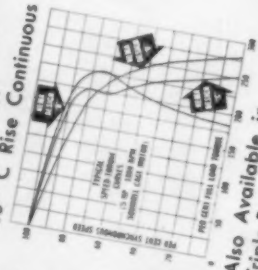

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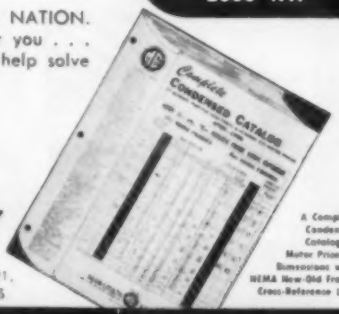

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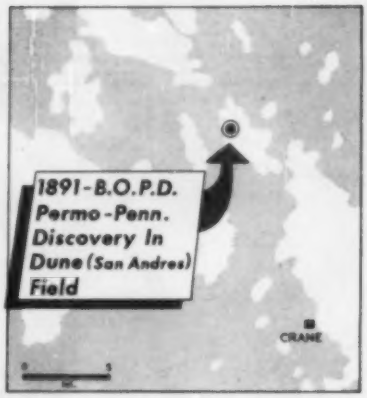

Gulf Oil Corp. 1 Adams, in the Dune field of Crane County, was dry in the Ellenburger but made a big well from the Permo-Pennsylvanian. Nearby production is Grayburg and other upper Permian age.

turn to explore the middle of an oil field. Gulf Oil Corp.'s recent discovery in northeastern Crane County is a good example.

Gulf 1 N. A. Adams is surrouned by Grayburg (upper Permian) producers in Dune field. On some maps Dune field is shown as a part of the big McElroy field, and Gulf's well is located on the northwestern tip of the area. Location is Section 2, Block 24, PSL Survey.

No 1 Adams was an Ellenburger test that had to back up and complete in the Permo - Pennsylvanian. Completion potential was 1,891 bbl. of 41°-gravity oil a day through 28/64-in. choke. Gas-oil ratio was 471:1, tubing pressure was 700 psi.

On ground elevation of 2,685 ft., formation tops in 1 Adams were: Devonian 9,093 ft., Silurian shale 10,074 ft., Silurian lime 10,200 ft., Upper Ordovician 10,330 ft., McKee 10,750 ft., Waddell 11,100 ft., Connell 11,250 ft., and the Ellenburger at 11,350 ft. There were a number of oil and gas shows in the lower zones but operators plugged back to 7,802 ft. for completion.

Coke County reef discovery . . . Humble Oil & Refining Co. 1 Bird completed as a Strawn reef discovery, flowing 150 bbl. of 41°-gravity oil a day through ⅜-in. choke.

The new well is 12 miles northwest of Robert Lee, and 3 miles southeast of the new Panther Gap (Pennsylvanian) field. Location is in SW SE of Section 474, Block 1-A, H&TC Survey.

Production was from perforations at 6,211-23 ft., which had been treated with 500 gal. of mud acid. Tubing pressure was 150 psi., gas-oil ratio was 791:1.

No. 1 Bird was an Ellenburger test, but failed to make commercial pro-

duction on tests of the interval between 6,709-27 ft.

Glasscock County strike . . . Shell Oil Co. 1 Currie, Wolfcamp discovery 6 miles north of Garden City, in 24-34-T3S-T&P Survey, recovered oil from another and deeper pay.

Tests in the Wolfcamp recovered clean oil at 7,672-7,730 ft., and flowed 47 bbl. of 44°-gravity oil in 1 hour on a test at 8,485-8,609 ft.

The new shows, probably in Pennsylvanian or Permo-Pennsylvanian, came on a 3-hour drill-stem test at 9,087-9,144 ft. Gas surfaced in 7 minutes, and recovery was 3,100 ft. of oil, plus 200 ft. of oil and gas-cut mud.

At last report, total depth was 9,315 ft., on projected depth of 11,400 ft. Drilling breaks were reported at 9,114-24 and 9,268-9,315 ft.

EAST TEXAS

Shamburger Lake Field Gets Two Completions

Shamburger Lake field, a first-quarter 1957 Paluxy field in north-central Smith County, gained two Paluxy wells.

Payne-Johnston et al 2 John Black, south of the field discovery, flowed 672 bbl. of 33-gravity oil a day on final test. The flow was through 20/64-in. choke, under tubing pressure of 625 psi. Perforations in the Paluxy were at 7,148-76 ft. Gas-oil ratio was 330:1. Location is in the John Lane Survey, A-557, which is 4½ miles north of Tyler.

Map shows relative location of Shamburger Lake field in northern Smith County. The new field is said to be separated from Hitts Lake field by a fault, in the approximate plane as shown by broken line.

Sun Oil Co. 3 Hawkins-Edwards Unit, also in the John Lane Survey, and a southwest extension to the Shamburger discovery, completed for 252 bbl. of oil a day through 12/64-in choke, with tubing pressure at 630 psi. and gas-oil ratio of 294:1. This well logged 40 ft. of net pay in the Paluxy, then perforated at intervals between 7,102-63 ft.

In the same field, Sun Oil 1 Willie Clay, John Lane Survey, was drilling shale and lime below 6,709 ft. at last report.

Shamburger Lake field was opened in February by Payne-Johnston 1 Black. Paluxy perforations were between 7,079½-7,153 ft. and initial potential was 652 bbl. of oil a day through 18/64-in choke.

WASHINGTON

McCulloch Abandons Its King County Wildcat

McCulloch Oil Exploration Co. of California has plugged and abandoned its 6,001-ft. 1 Pasquier in the Enumclaw area of King County, Washington. The operator quit the test after running an electric log, dipmeter and MicroLog.

This leaves Washington with two active wildcats—both being drilled by Utah Consolidated Oil Co. in the Copalis Beach region of Grays Harbor. Utah 22-1 Swansob was drilling at 4,150 ft. after losing the original hole at 4,333 ft. The other, 22-1 Hogan, was fishing bailer at 4,918 ft.

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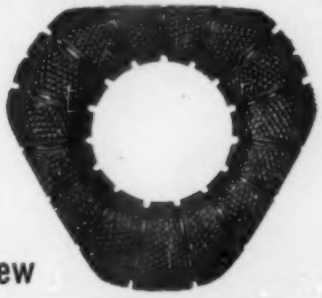

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THE OIL AND GAS JOURNAL

"Now, whatta' you suppose they want?"

Socony's Top Production Man

FRED W. BARTLETT is a fortunate man. He knew quite early in life what he wanted to do, undertook the pursuit of it, and has followed it since.

It was a successful pursuit. It led to the post of vice president of producing for Socony Mobil Oil Co. He has been a director of Socony since 1953 and was elected vice president last month.

Bartlett began his career with Socony as a geologist, a profession which he selected while he was still in high school. He was born in upstate New York and attended grade school and high school in Syracuse.

He wanted an outdoor life and, actually, his first interest was forestry. At that time, however, forestry didn't offer as wide a field of opportunity as it does today. A second and almost equal interest was rocks. So, he decided to study geology and enter the oil industry. It was apparent to him then that oil was an industry with a future.

Bartlett studied geology at the University of Michigan. He helped foot the bill by serving as a student assistant in the department of mineralogy. Student assistants had to be high up in their classes or they couldn't continue as such. This work plus some extra courses gave him some extra qualifications. He was graduated with a B.S. degree in 1921.

Early career . . . Even with these added qualifications, it wasn't easy to find a job as a geologist in the United States in those days. Companies hadn't yet fully recovered from the 1920-21 slump. But he did find one outside the country. It was with Mexican Eagle Oil Co. (Shell), as a field geologist. Mexican Eagle was then active along Mexico's famed Faja de Oro or Golden Lane. Discoveries there at that time were "a dime a dozen."

This was too soon after U. S. Marines had landed in Vera Cruz for the Mexicans to have forgotten. They were not kindly disposed toward those from north of the border. This and the uninviting living conditions of the Mexican Gulf Coast in those years soon surfeited the youthful Bartlett. After 2 years of it he resigned and returned to Syracuse.

He must have done a good job for Mexican Eagle. He hadn't been home long when another Shell affiliate, Roxana Petroleum Co., wired him a job offer. The company wanted him to go to work in Oklahoma as a geologist. He accepted and moved to the Sooner state in 1923. He spent the next several years there and then went on to Amarillo when things opened up in the Texas Panhandle.

FRED W. BARTLETT
. . . delayed becoming an independent.

Bartlett was a district geologist at Amarillo and then moved to Dallas as regional geologist. He went along when Roxana's offices were moved to Houston. His region embraced Texas, Louisiana, Arkansas, and Mississippi.

It was a big and important job but Bartlett wasn't entirely satisfied. He had long nurtured a desire to become an independent oil man. He finally succumbed and in 1938 turned in his resignation. This action precipitated two interesting twists in his life.

Joined Socony . . . Shortly after he resigned, and before he could become fully established as an independent, Socony was after him. The offer was so attractive that he accepted, intending to delay his independence for 2 or 3 years. These "2 or 3" years have become almost 2 decades.

Bartlett joined the Socony organization in 1939. His first job was chief geologist for European operations, with offices in The Hague, Holland. He arrived in The Hague in July of 1939. Less than two months later he was in Poland on a field trip. He was there just before Hitler invaded and World War II was on.

Bartlett and his party returned to their headquarters via a round-about route. It took them to Bucharest, then through northern Italy, Paris, and finally The Hague. European operations closed soon after so that his first job with Socony was extremely short-lived.

With war in Europe, attention to Western Hemisphere operations picked up immediately. Bartlett was sent to Venezuela July 15, 1940, as chief geologist for Socony Mobil Oil Co. of Venezuela. He was in charge when Socony made its first discovery in that country. This was Guario field in the State of Anzoategui in eastern Venezuela.

On February 1, 1943, he returned to the United States as assistant chief geologist in the producing department in New York. In 1947 he was named assistant to John C. Case, a director and vice president in charge of producing. He becomes No. 1 man in Socony's producing division as successor to Case, who retires July 1.

Bartlett was general manager of the producing department from 1949 to 1953. He was elected a director of the company January 1, 1953. He was made vice president in charge of producing at a meeting of the board following the last annual stockholders' meeting May 21.

While he has come a long way in his chosen field, he missed on one count. He wanted outdoor work. Now he is on the thirty-first floor of the Socony building, pretty close to the geographic center of crowded Manhattan Island.

He satisfies his outdoor desires now by gardening (he also has a small orchard at his home on Long Ridge Road in Stamford, Conn. He is a member of several industry organizations.

Fred Bartlett's philosophy and beliefs are typical of typical oil men. One thing he's positive on: Oil's going to keep on getting tougher and more costly to find.

William A. Skees has been appointed district geologist at Corpus Christi, Tex., for Pan American Petroleum Corp. He transfers to Corpus Christi from Midland, Tex., where he was area geologist. Skees has been with the company since 1951.

John C. Hostetler, formerly partner in Buckles & Hostetler, Monahans, Tex., consulting firm, has formed Hostetler Engineering in Monahans. The company will have independent production in addition to consulting work. **T. G. Ward** is chief engineer.

R. O. Van Fleet, production manager of Blanco Oil [illegible], has been elected vice president. Van Fleet has been with Blanco since 1938. Before that time he was assistant district superintendent with The Texas Co.

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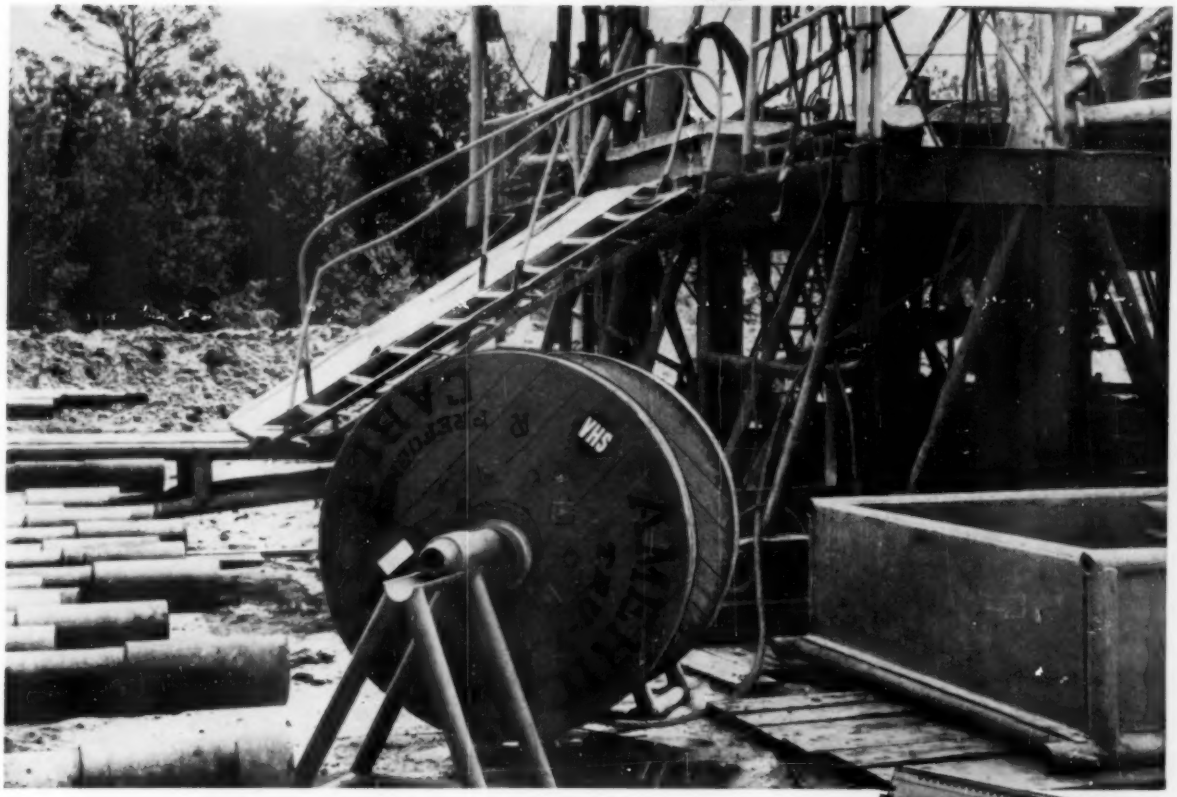

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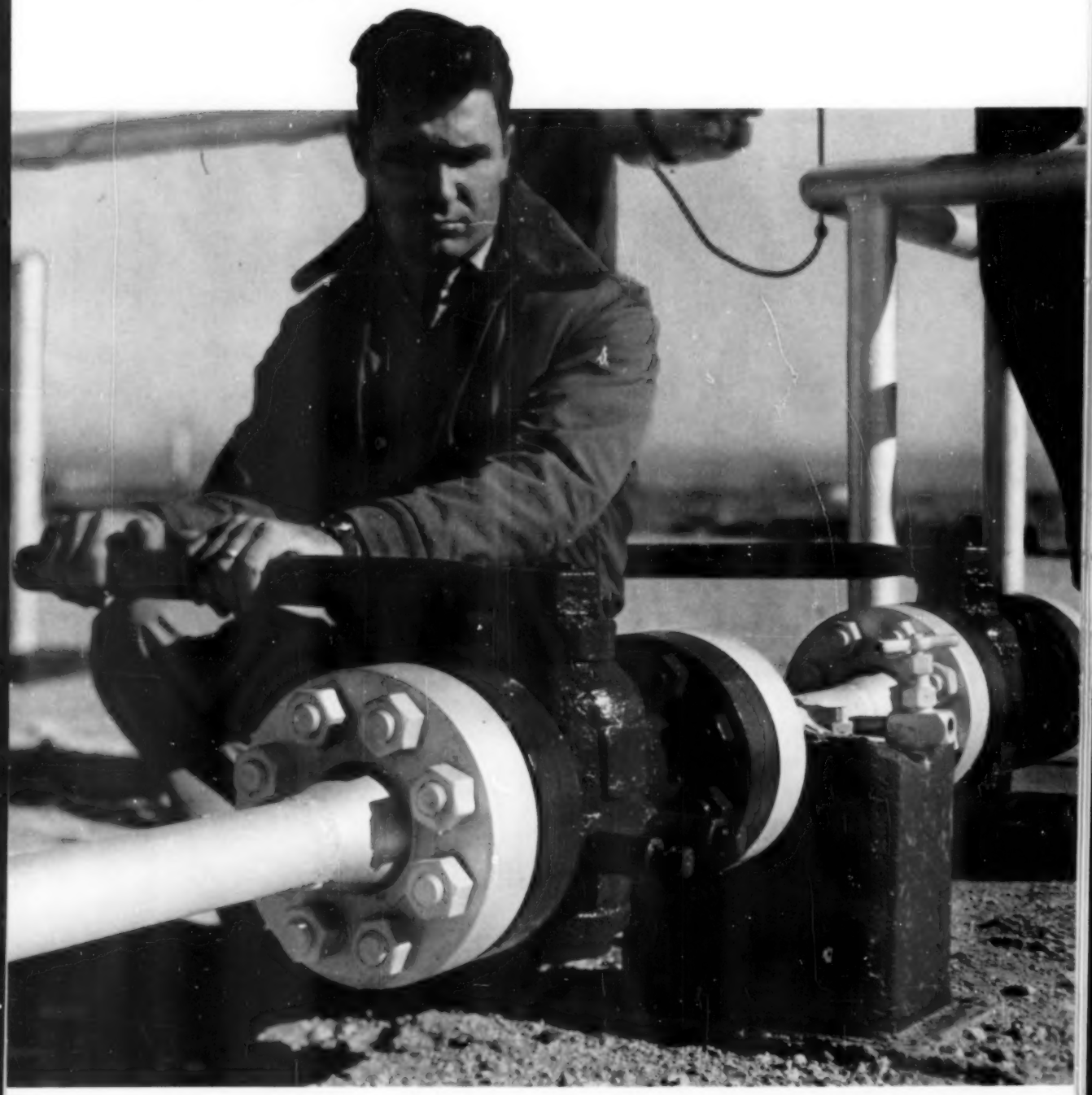
How these two brought lower valve costs to a West



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MISSION PLUG VALVES
Texas pressure maintenance plant

At the left, you see two of the three Mission Plug Valves that pointed the way to lower overall maintenance costs to the operators of a West Texas Plant. They proved to a skeptical management that Mission Valves *actually do cost less* because they last longer and require less maintenance.

These three valves were the only Mission Valves installed when the plant was built early in 1950. The two valves shown are installed on a scrubber blowdown near an injection well and the third was in the injection line just before the scrubber.

All three valves handle wet sour gas at 4000 psi. All have been in continuous service since 1950 and all three still work perfectly. They are among a very few of the original valves still operating.

Mission Plug Valves were originally accepted simply because no other valves were available. Their performance has been so outstanding that they are now among the first chosen for service at this plant.

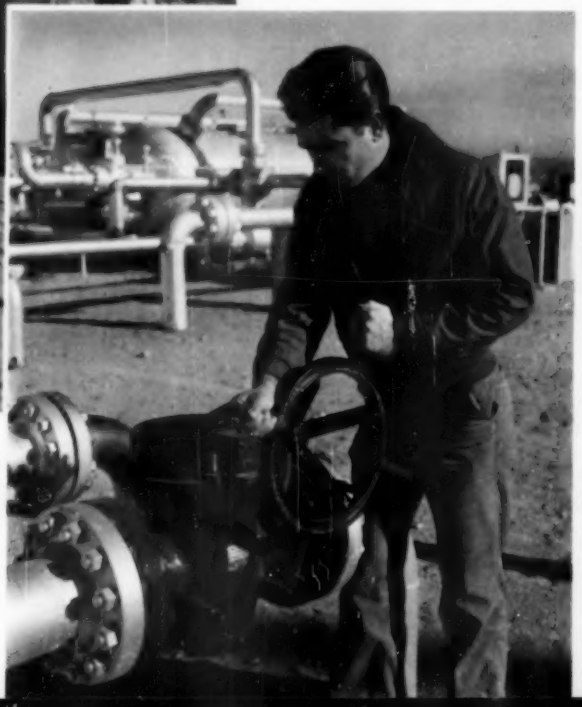
There are many reasons for the long life and dependability of Mission Valves, but the most important is the *Automatic-lubrication system* — exclusive with Mission in plug valves.

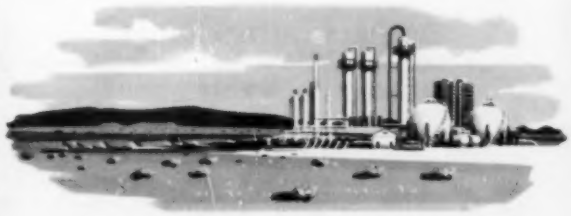
Without this system, a small leak could start and serious valve damage could occur before an attendant became aware that the valve was leaking.

But the automatic lubrication system serves as an untiring sentinel — automatically stopping leaks *before* they start — and before valve damage can take place.

Why don't you profit from this experience and install Mission *Automatic-Lubricated* Plug Valves on your wells or in your plants. You too, will discover a new low in valve costs and a new high in dependability.

Mission Plug Valves, like other Mission Products, are available through supply stores everywhere.





Nothing but the finest will bear the name of

MISSION
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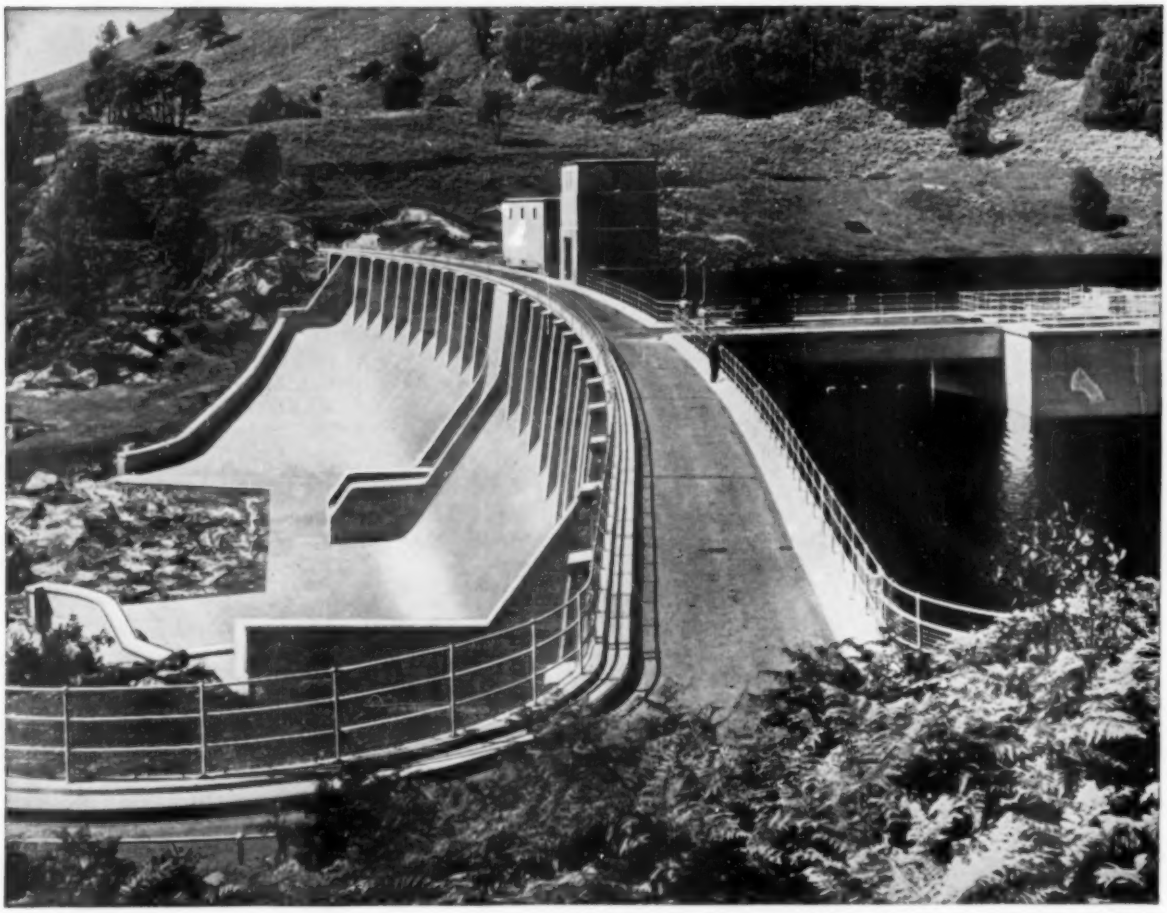
This six-inch Mission Plug Valve is one of three installed on a bypass manifold handling sweet gas. Other Mission Valves are installed at many locations in the plant.



Luichart Dam, one of the six main dams in the Conon Valley Project of the North of Scotland Hydro-Electric Board which will eventually produce 290 million units p.a. BP Energol turbine lubricants are used in all the Project's Power Stations.

BP AIDS SCOTLAND'S HYDRO-ELECTRIC PROJECTS

BP ENERGOL turbine lubricants are supplied to all the power stations of the North of Scotland Hydro-Electric Board.

Among these power stations are the six which figure in the Conon Valley Project in Ross-shire. These when completed will have a total installed capacity of 167,000 Kilowatts. Four of them are already in operation.

The British Petroleum Company is proud that its lubricants should have an important part to play in this great contribution to Scotland's present and future prosperity.

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Personals

J. E. KENDALL

J. E. Kendall has joined Blanco Oil Co. in San Antonio, Tex., as vice president in charge of geology, exploration, and land. Kendall was formerly with Phillips Petroleum Co. in Bartlesville, Okla., and before that was with **Kenneth Ellison,** Oklahoma City consultant, and Big Chief Drilling Co.

Jesse D. Winzenried, administrative coordinator for Husky Oil Co., has been named assistant to the president.

John H. Volosin, reservoir engineer with Sinclair Oil & Gas Co. in Tulsa, has joined Petroleum, Inc., in Great Bend, Kans., in the same capacity.

O. P. Puryear, Houston regional manager of technical service division for The Texas Co., has been appointed assistant manager of laboratory operations and transferred to Beacon, N. Y. Puryear has been with Texaco since 1927.

Brooke Pietsch, head of the process engineering department at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been transferred to Baltimore as head of the technical department there. **Bill Robinson,** head of the Baltimore refinery technical department, will exchange jobs with Pietsch and transfer to Linden as head of process engineering.

Gayden Derickson, assistant manager of Shell Oil Co.'s head office manufacturing engineering department since 1955, has been appointed chief engineer at the company's Norco, La., refinery. Derickson will be succeeded in New York by **R. K. MacIntyre,** assistant chief engineer at the Wood River, Ill., refinery. MacIntyre's assignment to the head office touches off a number of other changes at Wood River. **F. W. Rood,** assistant chief engineer, technical services, has been appointed assistant chief engineer, office. He will be succeeded in technical services by **E. D. Underwood, Jr.,** formerly assistant chief engineer, field. **G. C. Walker,** manager of the thermal cracking department, replaces Underwood as assistant chief engineer, field, and **W. B. Bryant,** manager of the aromatics department, moves up to succeed Walker. Also, **A. S. Lehmann,** assistant chief technologist at Wood River, has been named manager of the aromatics department, and he is succeeded by **E. W. Reiley, Jr.,** senior technologist.

Joseph B. Lassiter, Jr., senior economics engineer with Lion Oil Co., has been transferred to Houston from El Dorado, Ark.

Robert V. Phipps has joined the geological staff of Atlantic Refining Co. in Midland, Tex. Phipps was formerly with Gulf Oil Corp. and Texas Crude Oil Co.

E. E. Murray has been transferred by Humble Oil & Refining Co. from Houston, where he was senior petroleum engineer, to Ganado, Tex., as district petroleum engineer.

John E. Thomas has joined Laclede Gas Co. in St. Louis as geologist. He was formerly field geologist in Urbana, Ill., with Carl A. Bays & Associates, Inc.

Delbert L. Dugan, staff engineer with Tennessee Gas Transmission Co., has been promoted to district petroleum engineer and transferred to Hobbs, N. M., from Fort Worth.

J. M. Riddle, Moran Brothers, Inc., Farmington, N. M., has been elected first chairman of a newly formed chapter of American Association of Oilwell Drilling Contractors for the Four Corners and San Juan basin area. **Robert E. Jackson,** Empire States Drilling Corp., was elected vice chairman.

E. C. PATTON

E. Charles Patton, formerly in charge of reservoir engineering and related laboratory work for Magnolia Petroleum Co., is president of newly organized Reservoir Engineering Laboratories, Inc., Dallas. The company has bought and reorganized the petroleum-engineering laboratory of Petroleum Production Engineering Co. **Harold S. Deyo** is vice president and laboratory manager, and **George Hollabaugh** is assistant lab manager. Both were with Petroleum Production Engineering. Patton received the Raymond Memorial Award of the A.I.M.E. in 1948 and is former secretary-treasurer of the A.P.I. southwestern district of the Division of Production.

Pat Kelly has rejoined the Texas Railroad Commission as a member of its petroleum-engineering staff in Austin following 2 years' service in the U. S. Air Force. Prior to serving in the Air Force, he worked a year with the commission as an engineer in its Corpus Christi district office.

N. E. Tanner, president of Trans-Canada Pipe Lines, Ltd., has been elected chairman of the board, and **Charles S. Coates,** executive vice president and general manager, moves up as president succeeding Tanner. Coates was senior vice president of Tennessee Gas Trans-

N. E. TANNER

C. S. COATES

mission Co. when he joined Trans-Canada in 1954. Tanner was president of Merrill Petroleums, Ltd., speaker of the house in the Alberta Legislature, and Alberta's minister of lands and mines before becoming president of Trans-Canada.

Curtis R. Mills has been promoted by Sun Oil Co. from engineer trainee in Beaumont, Tex., to junior petroleum engineer in Morgan City, La.

Gabriel Dohy has been appointed district production engineer in Calgary for Canada-Cities Service Petroleum Corp.

Hoover L. Gibson, superintendent of Texas Gas Transmission Corp.'s Division 3 in the compressor-station department, has been appointed superintendent of compressor engineering. Gibson was with Stone & Webster Service Corp. and Arkansas Louisiana Gas Co. before joining Texas Gas in 1948.

T. L. McWilliams has been promoted by Texas Gas Transmission Corp. from compressor department division superintendent in Memphis to assistant superintendent of the compressor station department with headquarters in Owensboro, Ky. McWilliams suceeeds **J. B. Eaton, Jr.,** who was recently promoted to superintendent of the department.

J. M. Clark has resigned as Pacific Northwest Pipeline Corp.'s vice president in charge of production. He will remain as vice president of Northwest Production Corp., Pacific Northwest subsidiary, however. **Lester G. Truby, Jr.,** manager of operations for Pacific, has been promoted to manager of production. Both men have been with the company since 1955.

Personals

R. W. FRENCH, JR.

Richard W. French, Jr., has resigned as vice president in charge of production for Standard Oil Co. (Ohio) to become president of United Carbon Co. French succeeds **Thomas A. Whelan** as head of United Carbon. Whelan will remain as treasurer and chairman of the executive committee. **Rudy W. Edmund,** assistant general manager of Sohio's production department, has been named acting general manager to succeed French.

Pete Smith has joined Esso Standard Oil of Libya as assistant exploration manager. He was formerly geologist with Atlas Drilling Co. in Carmi, Ill.

N. B. Venus has been appointed district exploration manager by Tennessee Gas Transmission Co. in Salt Lake City. **Joe Wolf** has been transferred from Wichita to Casper as district exploration manager.

William M. Prindible, senior drilling engineer with Atlantic Refining Co. in Houston, has been transferred to Atlantic's subsidiary, Venezuelan Atlantic Refining Co., in Caracas as resident drilling superintendent.

Roger C. Ernst has been appointed assistant secretary of the Department of Interior for lands management. He replaces **Hatfield Chilson,** who has been promoted to undersecretary. Ernst was formerly Arizona lands commissioner.

A. S. (Steve) Gilliam, plant manager of Great Northern Oil Co.'s Pine Bend, Minn., refinery, has been elected a vice president of the company. Gilliam joined Great Northern last year. He was formerly project manager and assistant plant manager for Olin-Mathieson Chemical Corp.

F. Hugh Wilson has been transferred by Tidewater Oil Co. from Houston to San Francisco where he will be western division exploration manager. **Edd R. Turner,** exploitation geologist, will succeed Wilson in Houston as divisional geologist. Wilson joined Tidewater in 1940 and has been divisional geologist in Houston since 1954. Turner was with Humble Oil & Refining Co. before joining Tidewater in 1955.

Robert E. Aikman, vice president of Petroleum Exploration, Inc., Amarillo, Tex., has resigned to become a consultant.

Bill Dooley, chemical products coordinator at Esso Standard Oil Co.'s Bayonne refinery, has been appointed lube oil coordinator.

Fred F. Knapp, corrosion engineer with Richfield Oil Corp. in Long Beach, has opened consulting offices in Vista, Calif.

Bert R. Wheeler, research engineer; **Milton McClain,** research chemist; **Morris Roberson,** reactor computations engineer; and **Roderick G. Beck,** plant engineer, have joined the research staff of Phillips Petroleum Co.

C. A. Watts, Corpus Christi, Tex., consultant, has joined North Central Oil Corp., Houston, as chief engineer. Watts was division reservoir engineer with Shell Oil Co. before becoming a consultant in 1953.

Donald O. Swan has been promoted by Esso Standard Oil Co. from assistant general manager of the company's Baton Rouge, La., refinery, to assistant general manager of the manufacturing department with headquarters in New York. **Robert K. Dix,** operating superintendent of the Baton Rouge refinery, succeeds Swan there.

L. W. MOORE

L. W. Moore, executive vice president of American Oil Co., has been elected president succeeding **Donald J. Smith,** who has retired. Smith joined Standard Oil Co. (Ind.) at Whiting, Ind., in 1916. He has held various positions with Indiana Standard subsidiaries including president of Pan American Petroleum & Transport Co. and president of Pan American Refining Corp. He has headed Amoco since 1954. Moore was named Amoco's executive vice president in 1954. He was first vice president of Pan American Refining Corp. and president of Pan American Refining before that time.

J. R. Weaver has resigned as drilling superintendent for L. H. and S. A. Olson Drilling Co., Midland, Tex., to join Forster Drilling Co., Odessa, Tex., in the same capacity. He was with Parker Drilling Co. and Art Olson Drilling Co. before joining L. H. and S. A. Olson in 1952.

Clarence A. Haverly has joined Esso Research & Engineering Co.'s planning engineering division.

R. B. Sellers has been transferred by Phillips Petroleum Co. from Casper, Wyo., to Calgary as engineer.

Peter G. Burnett, consulting engineer with Ball Associates, has been transferred to Denver from Washington, D. C.

John D. Bartlett has been promoted by The Texas Co. from geologist in Wichita to district geologist in the company's new Liberal, Kans., offices.

W. R. ARGYLE

William R. Argyle has been elected president of Commerce Oil Refining Co. He succeeds **Harry R. Lewis,** who has been named chairman of the board. Argyle retired last year as vice president and director of manufacturing for Sinclair Refining Co., a position he had held since 1948. Also joining Commerce as vice president in charge of construction operations is **Herman G. Gunter,** formerly vice president in charge of refining for Suntide Refining Co., Corpus Christi, Tex.

R. E. Clarke, manager of gas organization in the producing department of Standard Oil Co. of California, has been appointed manager of natural-gas utilization.

G. W. Osborne has been appointed supervising construction engineer for The California Co. in New Orleans. **D. E. Hurst** has been named Gulf Coast division construction engineer.

J. F. Mathis has been appointed a section head and **C. T. Shewell,** senior research specialist in Humble Oil & Refining Co.'s technical and research divisions at Baytown, Tex.

Marvin A. Bomer, vice president in charge of refining and manufacturing for Eastern States Petroleum Co., Inc., and **Duncan Neblett,** vice president and general counsel, have been elected senior vice presidents.

R. N. Miller, Tidewater Oil Co.'s area engineer at Drumright, Okla., has been transferred to Hobbs, N. M., in the same capacity. **W. H. McPhail,** area engineer at Sallyards, Kans., has transferred to Drumright to succeed Miller and **C. J. Stumhoffer,** field engineer at Sallyards, becomes area engineer there.

Gordon R. Hinz, Houston consultant, has joined Commonwealth Oil Co. as geologist.

Paul Hopson has been transferred as staff geologist with Gulf Oil Corp. to Denver from Billings, Mont.

C. G. Taylor has been transferred by Cities Service Oil Co. from Hobbs, N. M., to Calgary as assistant production foreman.

Channing C. McAllister has joined Petroleum, Inc., in Great Bend, Kans., as gas production engineer. He was formerly petroleum engineer with Gulf Oil Corp. in Oklahoma City and Ardmore, Okla.

H. R. Hunter, petroleum engineer with Tennessee Gas Transmission Co., and **A. D. Hunter,** who recently retired after 33 years with Humble Oil & Refining Co., have formed Hunter & Hunter, Houston independent firm.

H. R. WALL

H. R. Wall has been promoted by Continental Oil Co. from manager of manufacturing in the southern and southwestern regions to general manager of the transportation and supplies department. Except for purchasing operations, he will succeed **T. A. Van Griethuysen,** who was recently named president of Continental Oil Co. of Venezuela. Wall has been with Conoco since 1935. He was superintendent of the company's Lake Charles, La., and Ponca City, Okla., refineries before his appointment as southern and southwestern manufacturing manager in 1954. Wall will continue to headquarter in Houston.

R. E. McPhail, Phillips Petroleum Co.'s assistant southeast regional manager and regional geologist, has been promoted to southeast regional manager in the land and geological department. He will headquarter in Bartlesville, Okla. He succeeds **J. E. Kendall,** who has resigned. **R. I. Sewell,** regional landman, has been moved up to assistant regional manager. **H. R. Segnar,** division exploration geologist in Oklahoma City, has been promoted to southeast regional geologist and transferred to Bartlesville. Segnar will be succeeded by **E. F. Wroblewski,** district exploration geologist in Ardmore, Okla., and **M. A. Vaughn,** assistant division exploration geologist in Oklahoma City, will replace Wroblewski in Ardmore.

Richard P. Trainer, administrative assistant to Shell Development Co.'s vice president in charge of research, has been promoted to technical assistant to the president and transferred to New York from Emeryville, Calif.

A. E. Woerheide, Jr., has resigned as vice president in charge of drilling and production of Byrd Oil Co., Dallas, to join Stekoll Petroleum Co. as chief engineer at the company's Dallas headquarters. Woerheide had been vice president of Byrd Oil since 1952. He was with Shell Oil Co. between 1936 and 1952, serving part of this time as division exploration engineer of the company's Gulf Coast and Mid-Continent divisions. He will be in charge of exploration, engineering on development work, and reservoir studies with Stekoll.

Peter C. Petroutson, formerly reservoir engineer with Pan American Petroleum Corp., has joined the oil department of Merchants National Bank of Mobile.

Personals

Tom Voorhees has been named district production manager for Cardinal Drilling Co. at Westboro, N. D.

B. D. Ford has been transferred by Tidewater Oil Co. to Keensburg, Ill., from Robinson, Ill., as engineer.

John B. Peri has joined the Whiting, Ind., research laboratory of Standard Oil Co. (Ind.). Peri was formerly with California Research Corp.

Clarence Oster has been promoted by Continental Oil Co. from test engineer in Odessa, Tex., to production foreman in Kermit, Tex.

Robert L. Kidd, president of Cities Service Oil Co., has received the alumni distinguished service award of his alma mater, the University of Indiana.

H. H. Carrick, Jr., has been promoted to superintendent of the southern division of General Petroleum Corp.'s production department in Los Angeles. He succeeds **A. W. Titus,** who recently retired.

DEATHS

Millard F. Waters, president of Waters Oil Co., died June 15 in Tulsa after an illness of several years. Waters, 66, was at one time president of Hanlon-Waters, Inc., a pipeline equipment firm which, with **S. S. Smith** of Shell Oil Co., developed portable pipeline stations widely used during World War II.

Ralph E. Sleppy, 69, who retired as vice president of Sunray Coastal Pipe Line Co., then a subsidiary of Sunray Oil Corp., in 1953, died June 17 in Tulsa. Sleppy joined the pipeline department of the old Barnsdall Oil Co. in 1916.

Arthur W. Jones, 52, district production superintendent in Dickinson, Tex., for Midstates Oil Corp., died June 12 in Dickinson. Jones had been with Midstates since 1934.

Dudley K. Bowen, 60, Mountain Fuel Supply Co. production division manager at Rock Springs, Wyo., died recently. Bowen joined the firm in 1929 after working for Ohio Oil Co.

John Francis White, 79, one of the early developers of California's Signal Hill field, died recently in Salem, Ore.

Charles Edward Bradford, 50, consulting geologist and independent operator of Midland, Tex., died June 16 in Midland. Bradford was one of several given part credit for the discovery of the big Scurry County oil fields in West Texas. He came to West Texas in 1940 with Standard Oil Co. of Texas. Later he worked for Herman and George Brown. He became an independent in 1953.

Dr. John Charles Rabbitt, staff geologist with United States Geological Survey, died June 10 in Washington, D. C. Rabbitt, 49, was assistant geologist with Montana State Bureau of Mines before joining USGS in 1942.

Oliver A. Sewell, 73, Coweta, Okla., independent, died June 16 in Tulsa.

Robert Munsey, 44, owner of B&M Drilling Co., Carmi, Ill., died recently in Carmi after a heart attack.

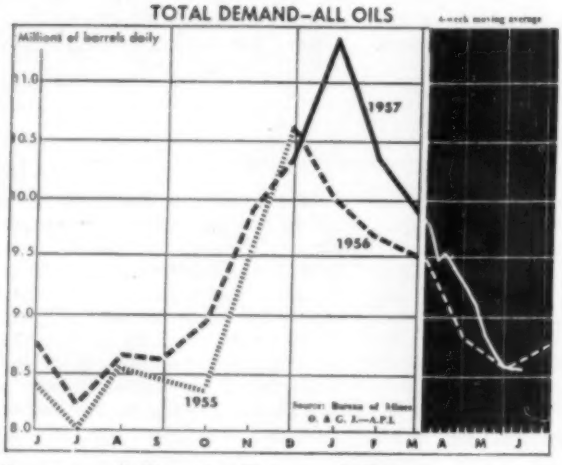
William N. Remkes, 59, field superintendent for Kilmarnock Oil Co., died June 15 in Orange, Tex.

Robert Oscar Bailey, retired Sapulpa, Okla., independent, died June 14 in Tulsa. Bailey, 69, retired in 1954.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,306,050	DOWN	41,975	UP	189,383
Crude stocks	268,451,000	DOWN	673,000	DOWN	6,696,000
Completions	978	UP	67	DOWN	88
Refinery runs	7,727,000	DOWN	353,000	DOWN	226,000
Gasoline stocks	191,601,000	DOWN	1,964,000	UP	10,114,000
Kerosine stocks	26,787,000	UP	639,000	UP	2,994,000
Distillate stocks	106,171,000	UP	4,382,000	UP	21,175,000
Residual stocks	42,870,000	UP	1,624,000	UP	5,551,000
Four-product stocks	367,429,000	UP	4,681,000	UP	39,834,000
Total imports	1,726,200	UP	243,600	UP	528,000



Improved Supply-Demand Balance Will Bring Better Product Prices

PETROLEUM product markets are looking up, a little. This does not mean that refiners are out of the "oversupply" woods. But, the outlook is brighter than it was a few weeks ago. There is a chance that most light-product prices have hit the summer low. Profits for the summer will depend on product price increases between now and the end of September.

On the Gulf Coast, spot gasoline prices are up about 0.25 cent a gallon. For example, 92-octane gasoline could be bought on the cargo market for about 10.75 cents a gallon in the first half of June. The general spot market now is 11.00 cents a gallon.

Market reports from the Gulf Coast show at least a normal amount of borrowing and lending of gasoline. This movement among refiners tends to prevent acute storage problems in the Gulf Coast area.

The loss of output from the six refineries in Illinois, Ohio, and Kentucky that have been closed by strikes has caused some firming of the gasoline market on the Mississippi River. The crude capacity at these refineries amounts to about 235,000 bbl. daily. The closing represents a drop in North Central gasoline production of better than 100,000 bbl. daily. Other reported reduction in refinery runs for the area could account for another 25,000 bbl. daily cut in gasoline production. U. S. production was off 100,000 bbl. daily for week ended June 14.

Announced reductions in crude runs at Gulf Coast refineries have tended to cut the oversupply of gasoline and have prevented further softening on the market.

There is a general feeling among some Mid-Continent refiners that the latest gasoline-price reduction may be the last for the summer. If refinery runs are tailored to meet actual demand, the Group 3 gasoline market may regain part of the ground lost since the first of June.

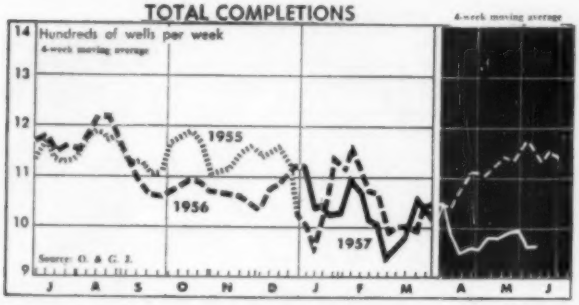
However, the Group 3 gasoline market could not be called firm. Reports indicate that intercompany sales may be at prices near 11.00 cents a gallon. Most any private-brand jobber can buy regular gasoline, delivered from pipeline terminals, at 11.50 cents plus pipeline charges. There have been unconfirmed reports of sales to large buyers at slightly lower prices.

The question of actual loss on refinery processing may put a brake on skidding product prices. If prices were to drop again, some refiners would be operating at a loss. In fact, some plants probably can't show a profit at current prices.

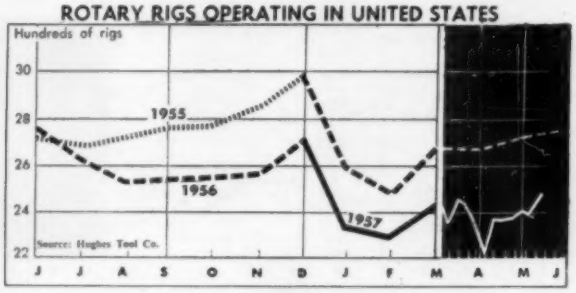
Regular gasoline on the Group 3 market at 11.50 cents a gallon is the same as last year. But, the cost of crude is up 25 cents a barrel and regular gasoline is one octane number better. The higher differential for premium just about covers increased costs. Kerosine and distillate prices are the same as for August and September 1956.

Distillate prices were adjusted downward in New York Harbor last week. Part of the reduction was listed as a price cut and part as additional summer discount. The new barge price of 10.85 cents for No. 2 fuel is 0.9 cent less than last spring. The new price for kerosine is 11.35 cents.

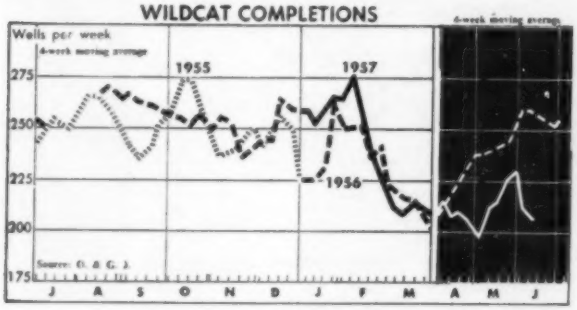
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	6-17-57	6-10-57	6-18-56
North Central and East	97	105	151
Southeast	51	48	35
Okla., Kans., Ark., Mo.	409	399	501
Louisiana	436	430	471
North and East Texas-Panhandle	391	352	432
Gulf and South Texas	199	203	251
West Texas-New Mexico	544	511	574
Rocky Mountain	250	253	276
Pacific Coast	106	97	128
Total United States	2,483	2,398	2,819
Canada	216	235	243

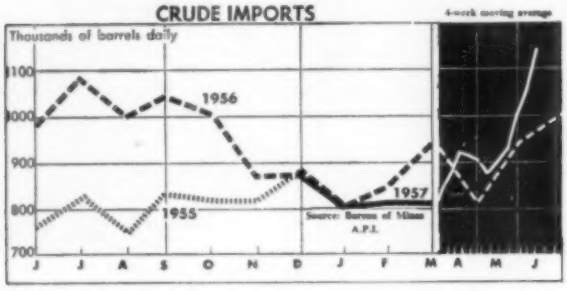
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 15, 1957

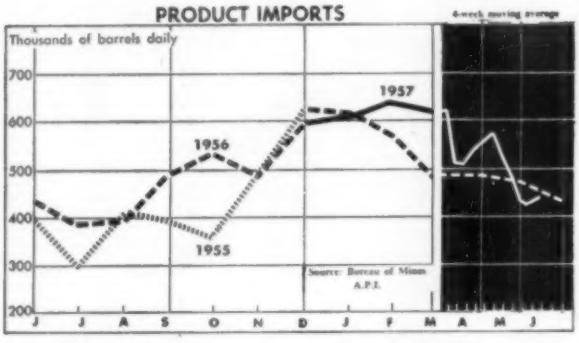
	Total of all wells							Wildcat completions and discoveries									
						Cum.							Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	†3	2	0	1	23,390	54	45	0	0	0	1	1	0	0	1	19	20
Arkansas	31	20	3	8	104,211	440	356	1	0	0	6	7	11	0	3	60	74
California	44	30	2	12	218,628	1,005	1,007	0	0	0	6	6	27	0	4	214	245
Colorado	16	2	0	14	88,762	387	534	0	0	0	10	10	13	0	9	237	259
Illinois	46	17	0	29	97,965	1,096	1,631	0	0	0	16	16	12	0	1	259	272
Indiana	11	3	1	17	15,632	288	281	0	0	0	3	3	5	0	0	53	58
Kansas	85	21	12	52	313,596	1,878	2,342	2	0	1	16	19	50	0	12	306	368
Kentucky	14	3	1	10	23,220	615	735	0	0	0	1	1	13	0	4	98	115
Louisiana	69	37	10	22	600,495	1,699	1,763	0	0	2	11	13	37	9	46	212	304
North	21	5	4	12	101,123	562	699	0	0	0	4	4	6	0	5	59	70
South	34	19	6	9	363,600	809	850	0	0	2	6	8	22	8	34	129	193
Offshore	14	13	0	1	135,772	328	214	0	0	0	1	1	9	1	7	24	41
Michigan	7	4	0	3	16,795	178	204	1	0	0	3	4	7	0	0	66	73
Mississippi	3	0	0	3	27,139	163	198	0	0	0	3	3	10	1	0	71	82
Montana	6	4	0	2	42,589	152	159	1	0	0	1	2	5	0	0	48	53
Nebraska	14	6	1	7	77,680	359	465	1	0	1	6	8	19	0	1	182	202
New Mexico	42	25	13	4	243,480	917	847	3	0	1	4	8	33	1	7	89	130
Northwest	13	1	11	1	61,586	343	328	1	0	0	1	2	14	1	5	28	48
Southeast	29	24	2	3	181,894	574	519	2	0	1	3	6	19	0	2	61	82
New York	9	4	0	5	9,250	213	.....	0	0	0	0	0	0	0	1	0	1
North Dakota	8	5	0	3	56,763	130	107	1	0	0	2	3	6	0	0	46	52
Ohio	21	12	4	5	53,716	466	471	0	0	0	0	0	0	0	0	3	3
Oklahoma	109	70	4	‡35	388,595	2,865	4,025	3	0	0	8	11	47	9	8	263	327
Pennsylvania	0	0	0	0	0	354	*427	0	0	0	0	0	0	0	15	20	35
Texas	401	282	15	104	1,711,142	9,918	10,094	24	4	4	49	81	300	39	96	2,090	2,525
Southwest (1 & 4)	55	33	4	18	161,587	1,231	1,467	1	2	1	10	14	39	14	27	353	433
Gulf Coast (2 & 3)	56	33	4	§19	391,360	1,146	1,250	4	1	2	10	17	23	17	44	302	386
East (5 & 6)	21	15	1	5	122,323	566	521	0	1	0	2	3	4	2	2	163	171
N. Central (7-B & 9)	104	66	2	36	320,324	3,539	3,646	12	0	1	15	28	160	0	13	898	1,071
West (7-C & 8)	145	118	3	24	637,330	2,820	2,629	6	0	0	11	17	68	0	8	345	421
Panhandle (10)	20	17	1	2	78,218	616	581	1	0	0	1	2	6	6	2	29	43
Utah	2	0	0	2	9,536	75	38	0	0	0	2	2	6	0	3	35	44
West Virginia	16	5	9	2	37,741	280	307	0	0	1	0	1	0	0	8	4	12
Wyoming	19	9	0	10	79,795	366	351	0	0	0	4	4	13	0	3	104	120
Miscellaneous (Va.)	2	0	2	0	9,876	32	58	0	0	0	0	0	0	0	1	24	25
Total United States	**978**	561	77	340	4,249,996	23,930	26,445	37	4	10	152	**203**	614	59	223	4,503	5,399
Total previous week	911	496	68	347	3,967,280	.....	.....	12	2	7	144	165	577	55	213	4,351	5,196
Total June 16, 1956	1,066	553	68	445	4,437,627	.....	.....	30	0	9	217	256	715	66	184	4,828	5,793
Cumulative, 1957	23,930	12,855	1,737	9,338	99,706,317	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Western Canada	82	55	4	23	393,460	1,202	1,092	4	0	1	14	19	31	0	25	266	322

*Incl. N. Y. †Ala. Service wells included: ‡3, §6.

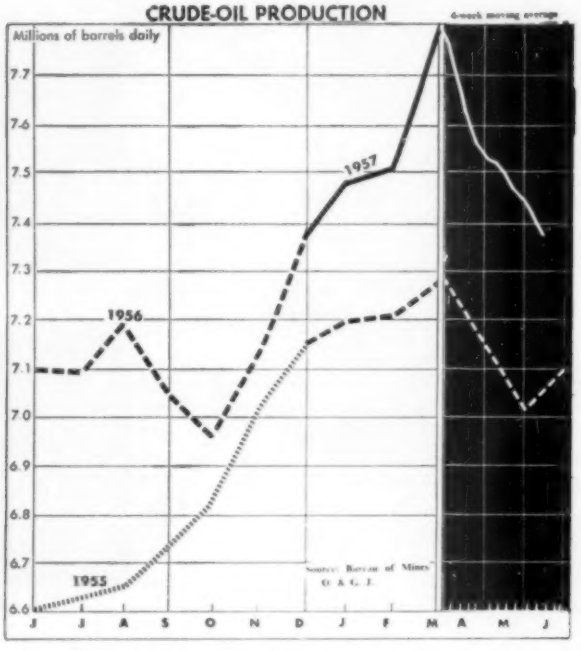
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

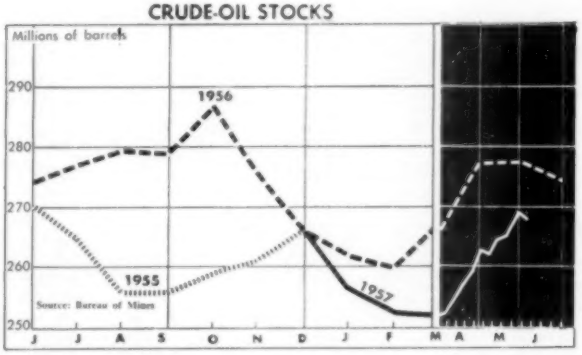


DAILY AVERAGE PRODUCTION FOR WEEK

	June 15, 1957 Crude-oil	Lease condensate	Total	June 8 total
Alabam	12,100		12,100	12,000
Arkansas	85,450	400	85,850	85,700
California	926,600		926,600	927,200
Colorado	152,550		152,550	152,000
Eastern	51,300		51,300	51,000
Florida	1,275		1,275	1,275
Illinois	207,500		207,500	227,500
Indiana	30,400		30,400	31,900
Kansas	†347,900		†347,900	†344,300
Kentucky	43,600		43,600	47,100
Louisiana	805,750	75,850	881,600	881,300
North	130,750	3,350	134,100	133,800
South	675,000	72,500	747,500	747,500
Michigan	27,300		27,300	28,200
Mississippi	110,600	4,500	115,100	115,100
Montana	73,850		73,850	73,800
Nebraska	52,225		52,225	49,850
Nevada	100		100	100
New Mexico	257,600	4,500	262,100	262,000
North Dakota	35,100		35,100	39,000
Oklahoma	†580,500		†580,500	†598,000
Texas	3,051,500	53,500	3,105,000	3,105,000
Dist. 1	53,500	450	53,950	53,950
Dist. 2	144,000	8,350	152,350	152,350
Dist. 3	435,000	26,200	461,200	461,200
Dist. 4	229,000	6,100	235,100	235,100
Dist. 5	40,000	300	40,300	40,300
Dist. 6	135,000	6,400	141,400	141,400
East Texas Field	200,000		200,000	200,000
Dist. 7-B	167,000	75	167,075	167,075
Dist. 7-C	163,000	3,600	166,600	166,600
Dist. 8	1,170,000	1,100	1,171,100	1,171,100
Dist. 9	213,000	600	213,600	213,600
Dist. 10	102,000	325	102,325	102,325
Utah	9,550		9,550	8,900
Wyoming	304,450		304,450	306,700
Others	‡100		‡100	‡100
Total U. S.	7,167,300	138,750	**7,306,050**	7,348,025
Change from prev. week, down			**41,975**	
Canada	†527,900		†527,900	†471,200
Total production—Jan. 1-June 15				1,255,712,925 bbl.
Same period last year (crude plus cond.)				*1,197,447,237 bbl.

*Includes 21,222,580 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



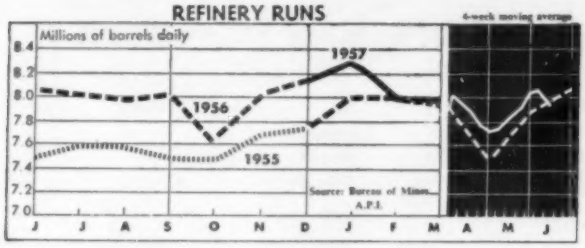
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

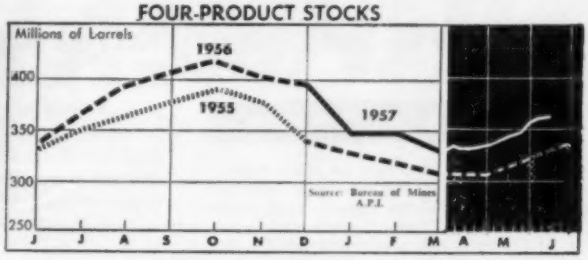
	6-8-57	6-1-57	6-9-56
Pennsylvania Grade	2,673	2,684	2,728
Other Appalachian	1,898	1,909	2,397
Illinois, Indiana, Michigan	9,622	9,346	10,728
Nebraska, North Dakota	2,082	1,775	2,535
Kansas	10,863	10,826	8,919
Oklahoma	21,292	22,169	27,571
Arkansas	2,932	2,787	3,040
Louisiana	18,396	18,889	16,115
North	2,846	2,948	2,572
South	15,550	15,941	13,543
Mississippi	2,614	2,643	3,149
New Mexico	8,166	8,093	7,612
Texas	124,295	124,260	124,658
East Texas proper	11,548	11,831	9,368
West Texas	59,199	58,412	60,544
Texas Gulf	23,584	23,051	22,403
Other Texas	29,964	30,966	32,343
Wyoming	16,484	17,044	18,072
Other Rocky Mountain	5,787	6,134	5,885
California	26,994	26,407	28,115
Foreign	†14,353	14,158	13,623
Total	268,451	269,124	275,147

*Bureau of Mines. †Includes 3,617,000 bbl. in California.

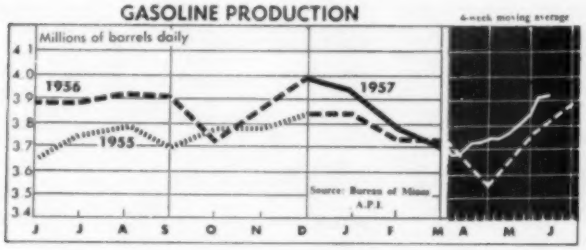
REFINERY RUNS



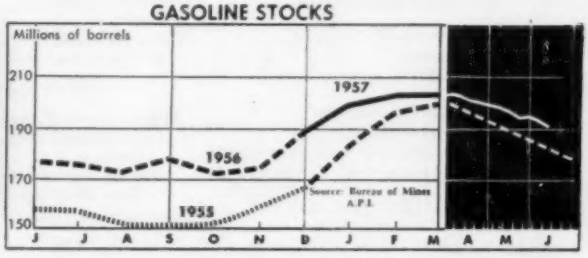
FOUR-PRODUCT STOCKS



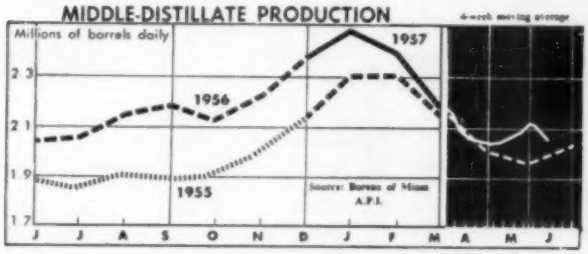
GASOLINE PRODUCTION



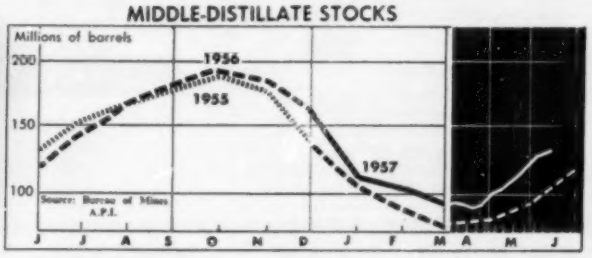
GASOLINE STOCKS



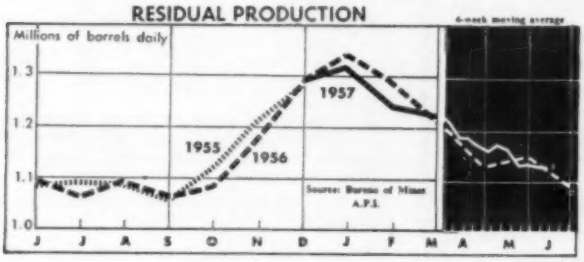
MIDDLE-DISTILLATE PRODUCTION



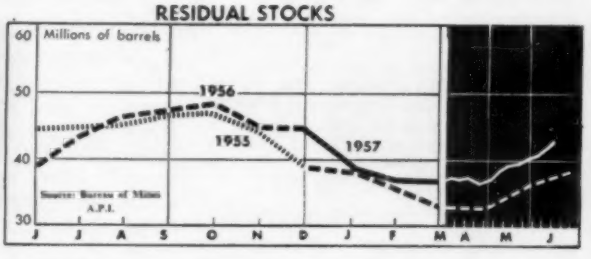
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JUNE 14, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,133	490.8	15.7	270.7	213.4	43,094	10,868	35,318	10,631	1,149	440.0	35.3	290.5	193.1
Appalachian:														
District 1	99	42.7	5.0	22.0	3.9	4,778	563	2,232	463	109	43.8	2.6	27.8	5.0
District 2	47	27.9	2.0	7.6	6.6	2,505	419	794	356	95	53.4	4.8	13.8	12.7
Ind., Ill., Ky.	1,313	694.1	50.4	242.9	160.4	33,470	5,021	16,440	5,607	1,359	688.0	71.4	251.8	146.6
Minn., Wis., Dak.	96	44.9	6.6	27.6	9.4	6,429	735	4,628	375	93	45.6	7.7	25.2	6.9
Okla., Kans., Mo.	721	404.7	9.4	170.1	30.9	17,380	1,358	9,591	918	717	399.8	14.3	169.1	30.1
Inland Texas	274	202.3	6.0	51.9	17.9	7,640	375	2,200	1,742	280	207.5	6.4	51.3	22.2
Texas Gulf Coast	1,888	955.3	74.1	471.7	227.4	26,346	3,184	12,841	5,820	2,040	971.5	94.1	510.7	262.9
La. Gulf Coast	648	370.6	59.7	174.1	46.0	10,426	3,051	6,026	1,308	740	373.5	38.3	182.4	49.0
N. La. and Ark.	84	27.0	5.9	17.9	4.4	4,550	618	1,793	48	99	36.1	6.7	25.1	6.4
Rocky Mountain:														
New Mexico	27	13.1	0.6	5.0	3.4	400	8	70	70	23	12.1	0.2	4.4	3.4
Other Rocky Mt.	293	135.3	3.0	66.7	38.4	7,331	233	2,752	1,168	286	135.2	4.1	63.3	33.1
California	1,014	484.7	7.6	164.1	330.0	27,251	354	11,486	14,364	1,081	473.2	4.2	139.3	327.0
June 14, 1957	7,727	3,893.4	246.0	1,692.3	1,092.1	191,601	26,787	106,171	42,870	8,071	3,879.7	290.1	1,754.7	1,098.4
June 7, 1957	8,080	3,995.1	286.1	1,780.0	1,191.6	193,565	26,148	101,789	41,246	.....	.....	.....	.....	.....
June 15, 1956	7,953	3,909.0	290.6	1,720.6	1,080.4	181,487	23,793	84,996	37,319	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (89 octane)	11.50-12.00
★ Premium (98 octane)	14.25-14.75
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-11.25
Regular (92 octane)	10.75-11.50
Premium (97 octane)	12.50-13.25
Premium (98 octane)	12.75-13.50
California (rack):	
Regular (88 octane)	13.1
★ Premium (96 octane)	15.5
Premium (98 octane)	16.2
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.25
Diesel oil (58 d.i. and above)	9.375-9.75
Distillate No. 1	9.375-9.75
Distillate No. 2	8.75-9.125
Gulf Coast (cargoes):	
Kerosine 41-43	9.625-10.50
Distillate No. 2	9.50-10.00
New York Harbor (barges):	
★ Kerosine 41-43	11.35
★ Distillate No. 2	10.85
★ Diesel fuel, 48-52 d.i.	11.15
Caribbean area (cargoes):	
★ Distillate No. 2	9.5

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.15-2.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.10
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67				
15-15.9	2.71				$1.89
16-16.9	2.74				1.94
17-17.9	2.78				1.99
18-18.9	2.82				2.04
19-19.9	2.85				2.09
20-20.9	2.89	$2.75		$2.62	2.14
21-21.9	2.93	2.77		2.64	2.19
22-22.9	2.97	2.79		2.66	2.24
23-33.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95		2.82	2.63
31-31.9	3.38	2.97		2.84	2.67
32-32.9	3.44	2.99		2.86	2.71
33-33.9	3.50	3.01		2.88	2.75
34-34.9	3.56	3.03		2.90	2.79
35-35.9	3.61	3.05		2.92	2.83
36-36.9	3.65	3.07		2.94	2.87
37-37.9	3.68	3.09		2.96	2.89
38-38.9		3.11		2.98	2.91
39-39.9		3.13		3.00	2.93
40 and up		3.15		3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12-2.14
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 39.0°-39.9°, Umm Said	2.19
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
★ Seria Light, 37°	2.75

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(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (USMC—20%)	$2.28
★ Gulf-U.S.N.H., dirty (USMC—27.5%)	2.07
★ Carib.-Denmark, dirty (USMC—30%)	5.29
★ Persian Gulf—All options (USMC—30%)	

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FOR SALE: 3, R. L. Cardwell Spudders. Double and Three Drum type. 86 Ft. Double Derricks. All tools complete. A. #1 Condition (NO JUNK). Write Rt. #4, Box #39-A or call 2648 Duncan, Okla.

FOR SALE: Late Model Cardwell Double Drum Spudders, Ser. #RL-666 and RL-701, complete with large inventory of tools and equipment (extra good). General Tool & Supply Co., Box 4387, Oklahoma City, Okla.

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25-800 H.P.

- 375 hp. Cooper-Bessemer GMX-6 new warranty.
- 800 hp. Worthington in operation. Too large for present job. Owner will sacrifice.
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- Two ea. 7 x 3½ x 7 tankem CP with jacket water & gas coolers—skid mounted with engines. Approx. 35 hp.
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- 60 CFM Le Roi compressor with paving breaker, mall point, chisels, and tamper pad. Hose & fittings. New warranty.

Carson Machine & Supply Co.

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Tulsa, Great Bend,
Garden City

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FOR SALE Cheap. K. L. Cardwell Spudder, lines mast and tools complete. Vergil Turner, 621 North Murphy St., El Dorado, Ark.

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7000 FT. 3½ I.F. modified drill pipe; 4⅝ tool joints; elevators; rotary slips; and six (6) 5¾ drill collars. Box 297, Tyler, Texas.

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EXCELLENT CONDITION

Model S Cardwell—2000' to 4000' Drilling
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Model U15 Unit Rig—4000' to 8500' Drilling

All equipped with Lee C. Moore Mast and substructure. Rigs complete in every detail.

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Model RL Cardwell 3 Drum Double Mast
Model 66 Wichita Spudder

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1—Wyatt 30" x 70" Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks, 50#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.

HOT-OIL PUMPS

3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd. 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Flg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Steel Flg. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS

6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
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Your Inspection Is Invited. Write for Catalogue.

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1 36L BUCYRUS Spudder complete with 5 and 7 inch tailing in tools. Dog house, butane tank, junk rack and light plant. Rod and tubing tools and hand tools. Phone Office 144, Res. 614, Cleveland, Oklahoma.

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(2) Hot Oil Pumps—Pacific 8 Stage Centrifugal 5S Lined Type ITB 2½" 334 GPM @ 1000 psi 750° F. 312 BHP

REBOILERS

993 Sq. Ft. 600# shell and tube
970 Sq. Ft. 250# shell 125# tubes

CONDENSERS—HEAT EXCHANGERS

Sq. Ft.	Shell		Tubes	
3100	steel	150#	steel	200#
1400	"	75#	12 pass	125 (2)
1080	"	250#	Admir.	125
940	"	125#	"	150 5 pass
760	"	125#	steel	125
331	"	250#	Admir.	250 (7)
331	"	250#	"	125 (3)

NEW FURNACE & CONDENSER TUBES

Quan.	O.D.	Wall	Length	Metal
6	6.625"	¼"	32'0"	Croloy 5
14	5.500"	¼"	32'0"	" 5
38	5.500"	11/16"	20'0"	" 2
95	4.000"	5/16"	24'8"	" 5
63	3.000"	¼"	15'0"	" 7
110	1.000"	11ga.	10'10"	Steel
475	.750"	13ga.	15'11"	"
417	.625"	14ga.	10'10"	Admiralty
175	.625"	14ga.	6'8"	"

PRESSURE VESSELS

3'x23'6" x 1⅛"—600 psi (2)
10,000 bbl. Horton Spheroid 15 psi @ 450° F.

TANKS

55,000 bbl.	115'	x 30'
10,000 bbl.	49'	x 29'
5,000 bbl.	35'	x 30'
27,000 gal.	10'	x 40' Horiz.
18,000 gal.	9'	x 36' x 3/8" Horiz.
15,000 gal.	9'	x 30' x ½" "
12,000 gal.	8'	x 30' x 3/8" "
10,000 gal.	10'	x 15' x ½" Vert.

TOWERS

4' x 49'6" x 7/8"—24 trays 330 psi
8' x 5' x 85'—25 trays 250 psi
8'x34'6"x½"—10 trays
6'x36'x½"—9 trays 100 psi
4'6"x39'5"x3/8"—14 trays
5'x58'x3/8"—26 trays 50 psi

PUMPS

1500	GPM	@	100' head	30 HP
1000	"	"	40' "	15 HP
900	"	"	125' "	40 HP
800	"	"	100' "	50 HP
600	"	"	100' "	25 HP
570	"	"	516' "	125 HP
400	"	"	225' "	40 HP
350	"	"	560' "	75 HP
250	"	"	223' "	25 HP

Large quantity other Centrifugal Pumps Motor driven, Turbine and Steam—Simplex—Duplex—Hot Oil Send us your requirements

Proportioneers 3XXL
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200 Tons 3/16" Plate 60" Wide x 8-25' RDMS

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Career opportunity for graduate mechanical or metallurgical engineer with minimum 10 years experience in design and/or inspection of petroleum producing and refining equipment. Must have actual 5 years inspection experience requiring thorough knowledge of methods procedures and inspection equipment. To develop methods of inspection and give consultation and guidance to engineers and inspection personnel in proper application and use of inspection procedures, tools and equipment. Assignment in Saudi Arabia.

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Write outlining background and experience. Please include telephone number.

Recruiting Supervisor, Box 216

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Mud Engineer
Diesel Rig Mechanic

Overseas U. S. Drilling Contractor has opening in North Africa-Mediterranean area for a qualified Mud Engineer, also a Diesel Rig Mechanic. Two year contract, single status, vacation and bonus allowance. Good opportunity. Send complete details of qualifications, personal data, and last ten years' employment. Replies confidential.

Reply To: Box K-216,
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Major independent with high growth potential is seeking petroleum engineers with up to five years experience for employment in its production department.
The starting salary for this callenging opportunity will be commensurate with your experience.
Please furnish complete details in regard to qualifications and experience, including salary required. If applicants are now employed, replies will be kept confidential.

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QUALIFICATIONS:—
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Salary Commensurate with Experience

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The Frontier Refing Company
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For Caracas, Venezuela

CHEMICAL ENGINEERING DEGREE.
MINIMUM 5 YEARS EXPERIENCE

including compressor plant operations, design and operating gasoline plants and gas pipeline work. Capable setting up department when required and working with government representatives.

GOOD SALARY, ALLOWANCES, OPPORTUNITY OBTAIN ADDITIONAL EXPERIENCE AND ADVANCEMENT.

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PETROLEUM ENGINEER

Graduate engineer with experience in oil producing operations including pressure maintenance, secondary recovery, primary and depletion. Initial assignment in New York office in reservoir engineering and research section concerned with oil field development studies. Salary and position commensurate with qualifications.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 217

ARABIAN AMERICAN OIL COMPANY

505 PARK AVENUE
NEW YORK 22, NEW YORK

HELP WANTED

PETROLEUM ENGINEER to be based in Bartlesville to manage water flooding operations of aggressive company in northeast Oklahoma. Prefer man with approximately five years' experience, with one or two years specialization in secondary recovery. Salary open. Address Slick Secondary Recovery Corporation, Milam Building, San Antonio, Texas.

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We are interested in employing Mechanical or Petroleum Engineers, preferably with a practical oil field background, including rotary or workover rig experience. Men in their twenties preferred; must be under age of 35.

Baker Oil Tools, Inc.

P. O. Box 3848 Houston 1, Texas

PETROLEUM OR CHEMICAL ENGINEER
MAJOR OIL COMPANY

has opening for graduate Petroleum or Chemical Engineer involving above ground petroleum losses. Applicants should preferably be between 28 and 35 and should have a minimum of 5 years field experience in the production fields, natural gasoline plants or gathering line systems. The position is permanent, located in New York City, with some travel involved.

Submit full particulars in resume form together with salary requirements. All replies will be held in strict confidence.

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Graduate Engineer required as Gas-Gasoline Plant Superintendent in Alberta. Previous operating experience as a prerequisite. Full employee benefits.

Apply in writing to

The British American Oil Company Limited,

Attention: A. A. WILLIAMS,
P. O. Box 130,
CALGARY, ALBERTA

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— ENGINEERS —

PETROLEUM
GAS
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MECHANICAL
PIPE LINE

Subsidiary operating in Venezuela has opportunities for engineers with/without experience. Salary commensurate with experience.

P. O. BOX #35
Bowling Green Station, New York 4, New York

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Maximum Age to 40

- ENGINEERS, ALL TYPES—Degree required. Exp. or inexperienced.
- GEOLOGIST, Deg.—Age to 32. Single.
- TOOLPUSHERS, 3 to 5 yrs. experience.
- MECHANIC GAS, 5 yrs. experience.
- MECHANIC DIESEL, 4 yrs. experience.
- FOREMAN CONNECTION, 3 yrs. experience.
- FOREMAN PRODUCTION, 5 yrs. experience.
- MUD TECHNICIAN, 1 yr. experience. Age to 32.
- STENOGRAPHER, Male, 1 yr. exp. Age to 32. Must be single.

All information confidential.
Send complete resume to:
OVERSEAS EMPLOYMENT SECTION

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SITUATIONS WANTED

GEOLOGIST: nine years Texas and Mid-Continent. Major, independent as District and Chief Geologist, and consulting experience. Can handle exploration, development, evaluation, completion. Masters degree. Desires responsible position with independent company. Box K-237, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGER desires position in south as refinery manager or terminal manager. 43 years of age, 25 years experience. Reply, if interested to: Box K-229, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, eighteen years of seismic interpretative and supervisory experience, mostly in Latin America, seeks more responsible position in foreign oil exploration. Married, 39 years old, employed. Box K-235, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL EXECUTIVE — M.B.A. finance. Good Wall Street connections. Desires assoc. with Independent needing expert financial counsel. Formerly controller Independent. Box K-232, The Oil and Gas Journal, Tulsa, Oklahoma.

THERMAL CRACKING, crude unit and absorption plant operator with ten years experience at superintendents level desires connection as refinery or terminal superintendent. Box K-234, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—7 years experience—thoroughly trained all phases. Can handle exploration and development program. Working knowledge of Land, Production, Tax and Finance. Abundant professional and business contacts. Desire salary-interest or retainer arrangement. Presently employed. Box K-223, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST: Thirty-one years old, married, degree, desires permanent location. Eight years in seismic and geologic work, field and office. Qualified to initiate, supervise seismic program in association with geological staff. Box K-234, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER, registered, 10 years experience design and development oil and gas production and dehydration equipment, desires research and development job. Box K-245, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

MECHANICAL ENGINEER: Age 40. Extensive field and administrative experience drilling and exploration. Background includes design and manufacturing oil field and mining equipment; engineering administration. Box K-241, The Oil and Gas Journal, Tulsa, Oklahoma.

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WANTED

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WANTED: Oil or gas production, any size, prefer, Okla., N. M., Tex., Colo. or Kan. B. Thurston, 1427 Princeton NE, Albuquerque, N. M.

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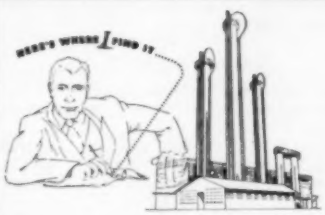
PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

LEGAL

U. S. intrust for the Seminole Indian Tribe of Florida, offers oil and gas leases covering 42,248 acres of land and one-half mineral interest in 1,280 acres of land known as the Big Cypress Seminole Indian Reservation, in Hendry County, Florida, to be sold at the Muskogee Area Office on July 9, 1957. Invitations to bid may be obtained by contacting Muskogee Area Office, Bureau of Indian Affairs, Muskogee, Oklahoma.



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TEXAS

TEXAS PANHANDLE

Roberts County Has New Morrow Field

A new Morrow-Pennsylvanian gas discovery area was completed in northeastern Roberts County by Sun Oil Co. The 1 Parsell estate, 22½ miles northeast of Miami in Section 155, Block 42, H&TC Survey, flowed 8,000 M.c.f. of gas per day absolute open flow plus 1.68 bbl. of distillate per million from deep lower Morrow sand perforations at 11,000-05 ft. This is the deepest Morrow sand production in the area. The deepest production in the Panhandle is at Laketon-Ellenburger field in Gray County.

Wildcat Activity on Upgrade in Lipscomb

Exploratory drilling is picking up in Lipscomb County as was forecast at the beginning of this year. Hansford and Ochiltree counties have held drilling sway in the Texas Panhandle for the past 3-4 years with only scattered drilling in the rank wildcat country in the northeastern part of the Panhandle. This section of the northwestern Anadarko basin is deep.

● Pan American Petroleum Corp. will drill a 10,300-ft. Mississippian wildcat in the northeastern part of the county about 9 miles southeast of the town of Follett and 5½ miles northeast of Lipscomb-Morrow sand field. The 2 Gex will be located in Section 875, Block 43, H&TC Survey.

● Sun Oil Co. will drill 1 Karl Laubban as a 10,800-ft. try in east-central Lipscomb in Section 608, Block 43, H&TC Survey. This one is 7 miles northeast of the town of Lipscomb and 4 miles southeast of Lipscomb-Morrow field.

● Sun will also drill 1 F. W. Walton in Section 609, Block 43, H&TC Survey, 7 miles east of the town of Lipscomb and 4½ miles southeast of the Lipscomb-Morrow field.

● Baker-Taylor Drilling Co. are working over an old wildcat in northeastern Lipscomb. The 1 Sam Reger, 3 miles east of Follett, found gas in the Morrow sand at 8,832-51 ft. The operator took the hole down to 9,300 ft., total depth. Originally it went to 6,540 ft. Location is in Section 1149, Block 43, H&TC Survey.

● Humble Oil & Refining Co. 1 Ola O. Piper, ½ mile west of Lipscomb town and an outpost to the field in Section 601, Block 43, H&TC Survey, flowed 115 bbl. of oil in 24 hours on ¼-in. choke from perforations in the Morrow sand at 9,968-86 ft.

● Sun Oil Co. 1 R. B. Tyson "A" in the east-central part of the county, 8 miles northeast of Lipscomb in Section 624, Block 43, H&TC Survey, is fishing. Total depth is 8,856 ft. This well blew out flowing 11,000 M.c.f. of gas per day plus distillate spray.

Lips Ranch Field Extended by Union

Union Oil Co. of California extended Lips Ranch field in Roberts County 1¼ miles east at 1-218 Carrie Killebrew. The well flowed 15,000 M.c.f. of gas daily from perforations in the Morrow-Penn sand at 8,726-39 ft. Location is 30 miles northwest of Miami in Section 218, Block 42, H&TC Survey.

Successful Wildcats

ALBERTA

Cities Service Oil Co. 16-31 Modeste, LSD 16, 31-48-5w5. Cardium discovery. TD 6,268 ft.

Phillips Petroleum Co. B-1 Pleasant, LSD 6, 30-6-10w5. Mississippian gas discovery. TD 5,156 ft.

White Rose-Cree-Supertest 10-33 East Lobstick, LSD 10, 33-50-7w5. Basal quarts gas well. TD 6,120 ft.

BRITISH COLUMBIA

Phillips A-1 Townsend in unsurveyed territory at 56° 35′ 36.24″ N. Lat. 122° 06′ 56.8″ W. Long. Mississippian gas well. TD 7,299 ft.

SASKATCHEWAN

White Rose-Devon Palmer et al 1-7 North Browning, LSD 1, 7-7-5w2. Mission Canyon oil well. TD 4,160 ft.

Imperial 1-21 Viewfield, LSD 1, 21-6-9w2. Mississippian oil well. TD 4,620 ft.

Whitehall 1-9 Glen Ewen, LSD 1, 9-3-1w2. Charles oil well. TD 4,326 ft.

Gridoil 4-1 North Colgate, LSD 4, 1-6-14w2. Indicated Charles oil well. TD 4,924 ft.

NORTHWEST NEW MEXICO

Rio Arriba County: Standard of Texas 1 Federal 1-27, NE SW SE 27-24n-7w. IPF 70 BOPD, Gallup discovery, new field. TD 6,956 ft. Morrison.

San Juan County: Reynolds Mining Co. 1 S. Huerfano, NW SE SW 33-24n-9w. IPP 12 BOPD, Gallup discovery, new field. TD 6,022 ft. Graneros.

McRae Oil & Gas Co. 1 Federal, SW NE NE 28-28n-10w. IP 15,000 M.c.f. of gas per day, Dakota discovery, new pay. TD 6,730 ft. Graneros.

SOUTH LOUISIANA

Plaquemines Parish: The California Co. B-1 St. Lse 2938 (formerly Cities Service Oil Co. 2 St. Lse. 2938), 22-s-20e. IP shut-in gas discovery, perfs. 12,151-55 ft. TD 13,075 ft. Gas discovery.

Terrebonne Parish: Hassie Hunt Trust 1 M. S. Nelson-St. Lse 2785, 23-20s-12e. IPP 120 BOPD, 2,000 M.c.f. of gas per day, 10/64-in. choke, perfs. 12,936-44 ft., 56°, GLR 16,667:1. TD 15,556 ft. New discovery.

SOUTH TEXAS

Bee County: A. A. Bus Moore et al 1 E. D. Purcell, 6½ miles northwest of Tynan, BS&F Sur. A-119. IP not reported, perfs. 3,548-55 ft. TD 3,568 ft. Gas discovery.

Goliad County: Harkins & Co.-W. Carlton Weaber 1 Schroeter, 5 miles southwest of Weesatche in Jose Maria Mancha Sur. A-203. IPF 148 BOPD, 11/64-in. choke, 34.4°, GOR 1016:1, perfs. Wilcox-Luling 7,631-34 ft. TD 8,015 ft. New oil discovery.

Duval County: Continental Oil Co. 2-D Clara Driscoll Est., 12 miles southwest of Benavides on Santa Rosalia Grant, Sweden Farm Lots A-476. IP 1,430 M.c.f. of gas per day, dry, shut in. Jackson perfs. 2,557-63 ft. TD 2,750 ft. New gas discovery.

Kleberg County: Sun Oil Co. 373-1 Baffin-State, 6 miles east of Riviera at Riviera Beach 8,050-ft. Frio field on Laguna de los Olmos St. Tr. 373. IPF 129 BOPD, 39.8°, GOR 395:1. Frio 8,050 ft. sand 8,057-72 ft. TD 9,651 ft. New oil discovery.

Live Oak County: Skinner Oil Corp. and H. R. Smith 1 J. I. Haily, 4½ miles northwest of Dinero in Maria Brennan Sur. A-3. IP 6,400 M.c.f. of gas per day, Pettus perfs. 4,417-23 ft. Dry gas. TD 5,402 ft. New discovery.

Nueces County: Arkansas Fuel Oil Corp. 1 St. Tr. 751, 3 miles west of Portland in Nueces Bay. Shut-in oil discovery. Perfs 9,559-64 ft. TD 10,007 ft.

TEXAS GULF COAST

Tyler County: Oil Reserves Corp. 1-K Kirby Milhome, 3 miles southeast of Fred in J. Milhome Sur. A-448. IPF 60 BOPD, ¼-in. choke, perfs. 9,026-33 ft. GOR 2795:1, 47°. TD 9,655 ft. New oil discovery. Suggested field name — Black Creek.

Wharton County: Claud B. Hamill 1 F. B. and D. Duncan "B," 3.5 miles east of Egypt in David Wade Sur. A-64. IPF 20,400 M.c.f. of gas per day, Yegua 7,225-31 ft., GLR 33:1. 54.4°. TD 7,740 ft. Gas-distillate discovery.

WEST TEXAS

Cochran County: Humble Oil & Refining Co. 1 Slaughter estate, Lab. 62, Lge. 149, Randall CSL, 7 mi. W Lehman. IPP 20 BOPD, 27-gravity, San Andres 4,918-32 ft. TD 5,000 ft.

Pecos County: Standard Oil Co. of Texas 1-24 Perry, 4-Z-TCRR Sur., 10 mi. SE Bakersfield, 4 mi. NW Sheffield field. IP 185 BOPD, 16/64-in., 36-gravity, GOR 816, TP 400 psi., Cisco 7,035-55 ft. TD 9,757 ft., elev. 2,630 ft., top Ellenburger 9,472 ft.

WEST CENTRAL TEXAS

Jones County: British American Oil Producing Co. 2-B Butler, W. Littlefield Sur. 282, 7 mi. NE Trent. IPP 32 BOPD, 39-gravity, pay 2,554-68 ft. TD 4,650 ft.

Fryer & Hanson 1 Homer Tye, 14-17-T&P, 4 mi. SE Noodle. IPP 78 BOPD, 41-gravity, Cisco 3,223-50 ft. TD 3,330 ft.

Tennessee Gas Transmission Co. 7 Bryan Dunagin Unit, 16-17-T&P, 2½ mi. NW Stith. OWPB, originally completed in Gunsite. TD 2,935 ft., PB 2,770 ft., IPP 61 BOPD, 38-gravity, Cook sand 2,529-35 ft.

Palo Pinto County: C. K. West 1 Seaman

estate, Sec. 5, GH&H Sur., 14 mi. NW Palo Pinto. IP 21 BOPD, 18/64-in., 38-gravity, GOR 1900, TP 200 psi., Marble Falls 4,157-62 ft. TD 4,221 ft.

Throckmorton County: Strawn Drilling Co. 1 N. Burton, Sec. 3048, A-770, TE&L Sur., 5 mi. NE Throckmorton. IP 672 BOPD, ½-in., 42-gravity, GOR 550, TP 530 psi., Caddo 4,451-59, 4,473-77 ft. TD 4,759 ft.

SOUTHEAST NEW MEXICO

Lea County: Amerada Petroleum Corp., 1-B Mathers, 33-11s-33e, 8 mi. SE Caprock. IP 232 BOPD, 18/64-in., 46°-gravity, Pennsylvanian 8,641-57 ft. TD 9,930 ft., elev. 4,281 ft.

Wilson Oil Co. 1 Muse, 21-20s-34e, 17 mi. SW Monument. IP 56 BOPD, 20/64-in., 31°-gravity, pay 3,513-18 ft. TD 3,691 ft.

WEST VIRGINIA

Tucker County, Licking district: Hope Natural Gas Co. 10017 Thaddeus Pritt, elevation 2,256 ft., 13,732,000 cu. ft. gas after fracture, rock pressure 2,070 psi. in 48 hours, Tully 4,098-4,120 ft., Oriskany sand 4,580 ft., gas in this formation. TD 4,738 ft. in Helderberg.

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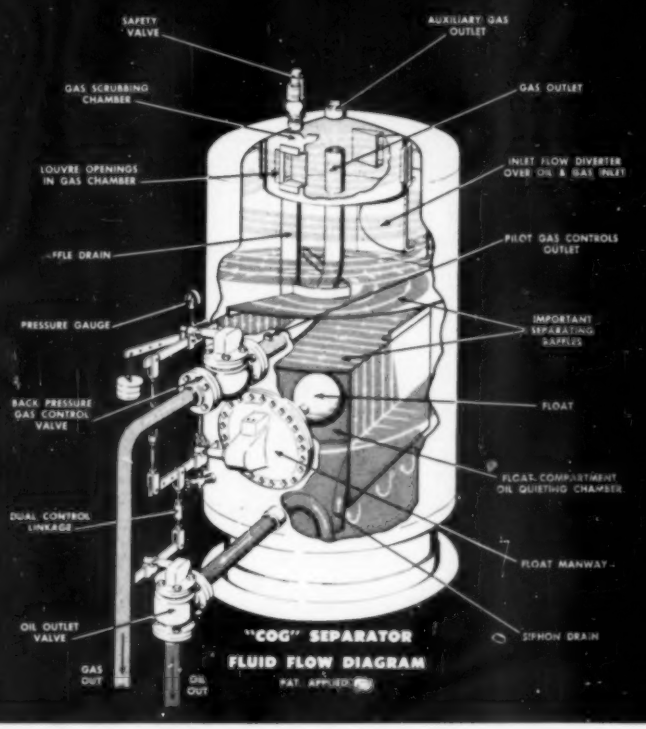

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PAT. APPLIED FOR

FOR MAXIMUM CONSERVATION OF OIL AND GAS

FLOW DESCRIPTION

The incoming well fluid enters the separator through a specially designed extra heavy cast steel diverter that turns the well fluid against the circular side walls of the separator, thus giving the incoming fluid centrifugal motion. An adequate side wall wear plate at the inlet prevents wall erosion.

OIL STREAM

The oil travels circumferentially about the separator in a relatively thin film, thereby presenting a larger surface from which the entrained gas is "broken out." This larger oil surface contributes toward greater oil capacities. The greater the fluid volume at the inlet, the greater the initial fluid velocity and the longer the scrubbing travel against the side wall of the separator; that is, the higher the jet velocity at the inlet, the farther the fluid will travel around the side wall of the separator before coming in contact with the first horizontal baffle plate.

Here the liquid continues to be spread in a thin film forcing more gas to be liberated, then the liquid cascades from the first horizontal baffle plate down to the top of the quieting chamber to continue its travel in a thin film. The liquid flows over the quieting chamber roof and side wall. Note that oil is collected outside of the quieting chamber and has further opportunity to liberate entrained gas. The oil in this chamber containing the least entrained gas is drawn off the bottom and flows under the baffle into the final quieting chamber. The oil is withdrawn from the bottom of the separator through a siphon oil outlet.

Free gas is prevented from entering the quieting chamber which assists greatly in producing early equilibrium at the separator pressure. The quieting chamber provides a relatively quiet surface within the separator on which the float rides thus conveying smooth action to the oil valve actuating equipment.

GAS STREAM

The gas stream, after initial or inlet separation, travels a well designed tortuous path, such that proper velocities are maintained through the gas scrubbing stages. The gas stream undergoes centrifugal scrubbing against the separator shell, against the outer surface of the gas chamber and through numerous louvre openings in the chamber wall as it enters the chamber. Inside the chamber it is further scrubbed on the inner walls. The oil that is entrained with the gas is drained away from the scrubbing gas stream through the drain pipe to the quieting chamber.

NEW IMPORTANCE of DE-GASSING OIL

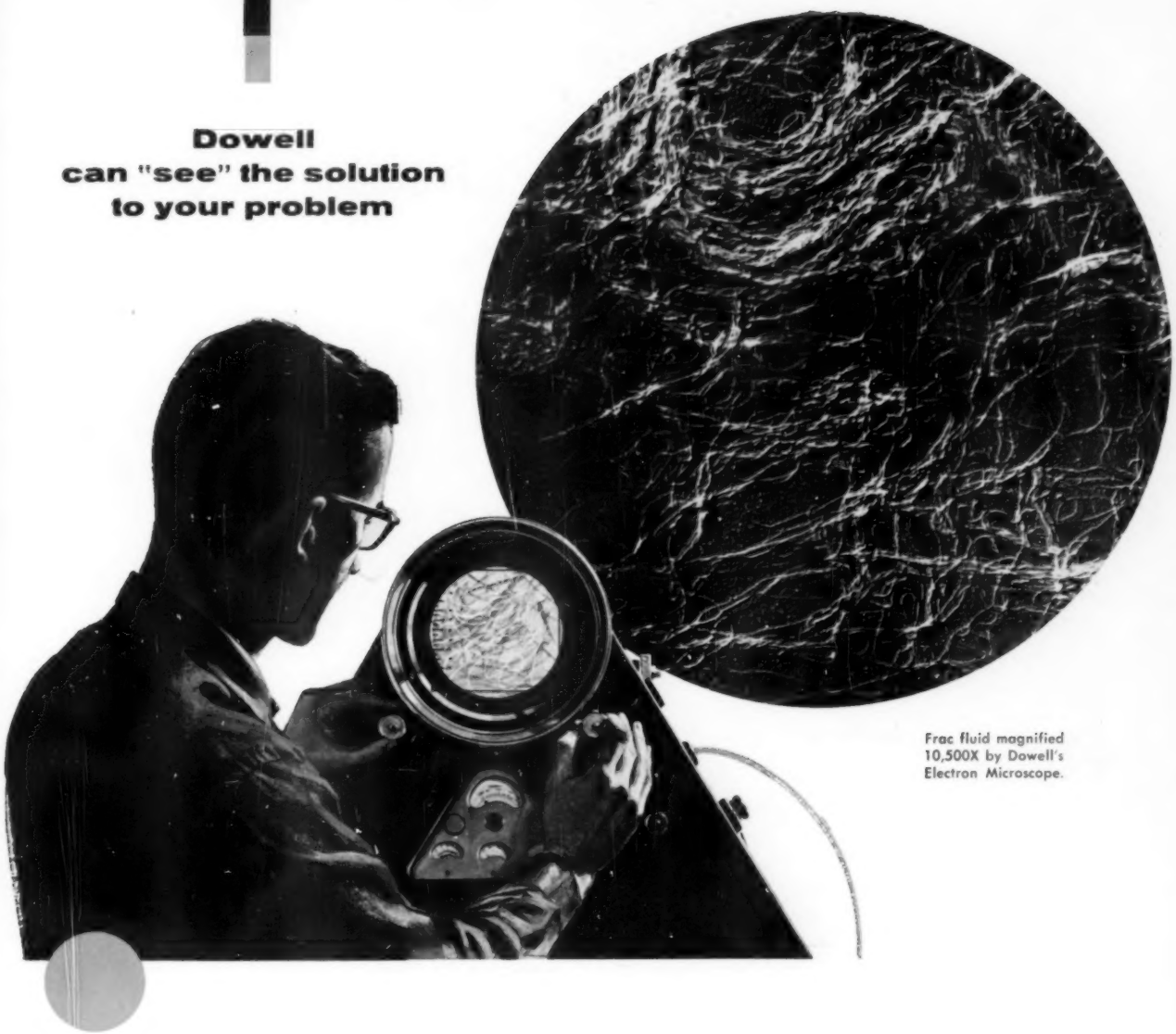
THE "COG" WILL HANDLE MORE OIL TO THE SAME DEGREE OF DE-GASSING THAN SEPARATORS OF THE SAME RETENTION VOLUME; or, DO A BETTER JOB OF DE-GASSING AT THE SAME THROUGH-PUT of other types of separators of the same retention volume.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

*REGISTERED TRADEMARK

Dowell can "see" the solution to your problem



Frac fluid magnified 10,500X by Dowell's Electron Microscope.

Ordinary chemical and physical analyses do not always disclose why fracturing fluids with similar viscosities differ so widely in sand-carrying capacities.

Dowell, in its never-ending attempt to probe beyond the ordinary, has equipped its research laboratory with an Electron Microscope, enabling its scientists to *see* the solution to this problem and many more.

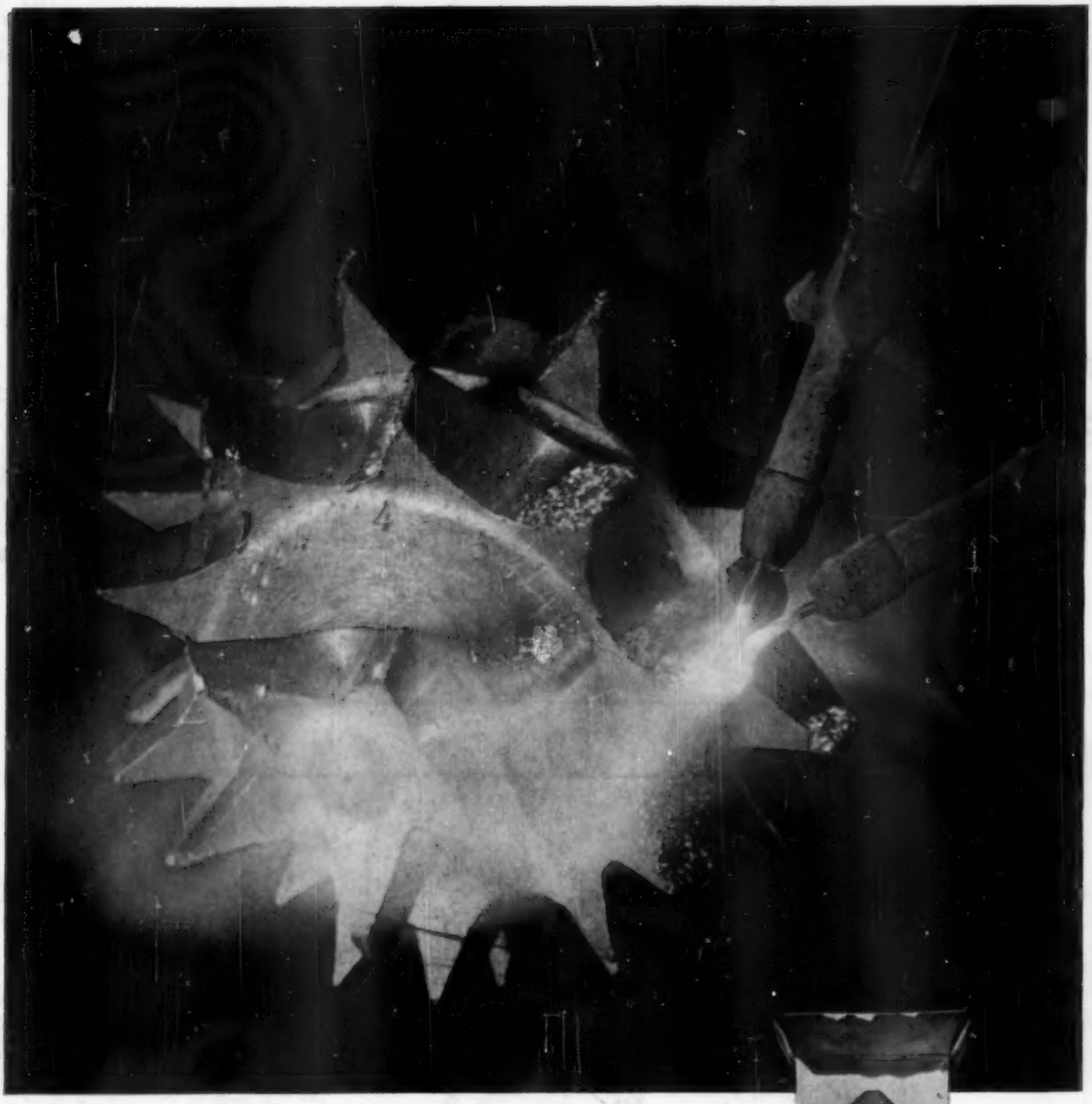
A study of Electron Micrographs, such as the one above, helps Dowell to recommend the right frac fluid for your well—the fluid that puts more sand into the fractures of your formation.

"Research" is not lip service at Dowell. It's a full time job, making its business the scientific examination of every detail of fracturing, acidizing and cementing. Careful attention to such details—plus the exclusive remote-controlled Allison Pumpers and the widest selection of well treating chemicals—add up to the big difference you get when you call Dowell. Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY



HARDFACING

when and where it's needed!

— another reason you make hole faster with Hughes Rock Bits

How and where hardfacing is applied is as important as the hardfacing material itself.

In getting the facts to determine the *best* application and placement of hardfacing, over one hundred thousand rock bits are examined in the field and the laboratory each year.

The combination of experience, our own superior hardfacing (Hughesite) and the knowledge of just where and how to apply it, is still another reason why HUGHES rock bits can be depended upon to deliver consistent, dependable performance, time-after-time.